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METHODS

OF

CHEMICAL CONTROL

FOR

CANE SUGAR FACTORIES
1916

COMPILED BY THE COMMITTEE ON REVISION OF METHODS
AND ADOPTED BY THE HAWAIIAN CHEMISTS'
ASSOCIATION, OCTOBER 22, 1915.

HONOLULU, HAWAII, APRIL, 1916

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Methods of Chemical Control for Cane Sugar Factories.

As Compiled by the Committee on Revision of Methods and Adopted by the Hawaiian Chemists' Association, October 22, 1915.

DEFINITIONS.

Cane is the raw material in the condition in which it enters the mill, including adhering field trash, soil, water, etc.

Field Trash is the leaves, tops and dead stalks mixed with the clean cane as it is gathered in the field.

Fiber is the total insoluble solids in the clean cane plus the total insoluble solids in the trash; the determinations must be made separately.

Sucrose is the substance indicated by the Clerget or double polarization. In the case of bagasse and press cake, or where the difference would be less than the experimental error, the direct polarization is taken to be the per cent sucrose.

Polarization is the figure and the substance indicated by the direct reading of the polariscope.

SOLIDS:

Total Solids are those obtained by actual drying.

Gravity Solids are those indicated by the Brix hydrometer, or pycnometer. Gravity solids of a pure sugar solution of any concentration are identical with the total solids. Gravity solids of impure sugar solutions such as are encountered in a cane sugar factory are generally greater than the total solids, owing to the fact that the impurities in cane juice at any given concentration have a higher specific gravity than that of a pure sucrose solution of the same concentration. The lower the concentration of these impurities, the greater will be the relative difference in density.

Suspended Solids are the solids in the juice not in solution.

Brix is the figure that indicates the percentage of gravity solids.

Refractometer Solids are those indicated by the refractometer.

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PURITIES:

$$\textbf{True Purity} = \frac{100 \times \text{Sucrose}}{\text{Total Solids}}.$$

$$\textbf{Gravity Purity} = \frac{100 \times \text{Sucrose}}{\text{Gravity Solids}}.$$

$$\textbf{Refractometer Purity} = \frac{100 \times \text{Sucrose}}{\text{Refractometer Solids}}.$$

$$\textbf{Apparent Purity} = \frac{100 \times \text{Polarization}}{\text{Brix}}.$$

$$\textbf{Apparent Refractometer Purity} = \frac{100 \times \text{Polarization}}{\text{Refractometer Solids}}.$$

$$\textbf{Glucose Coefficient or Ratio} = \frac{100 \times \text{Glucose}}{\text{Sucrose}}.$$

$$\textbf{Ash Coefficient} = \frac{100 \times \text{Sucrose}}{\text{Ash}}.$$

JUICES:

Normal Juice is the entire juice of the cane.

First Mill Juice is that issuing from the crusher and the first mill.

Mixed Juice is the combined juice from all the mills, including maceration water.

Last Mill Juice is the juice from the bagasse roller of the last mill.

Clarified Juice is the juice entering the supply tank of the evaporator.

Press Juice is the combined runnings from the filter presses.

Syrup is the concentrated juice entering the supply tanks of the vacuum pan.

Massecuite is the mass of sugar and molasses discharged from the vacuum pan.

Molasses is the product separated from the sugar in the centrifugals.

Bagasse is the residue from the final crushing of the cane.

Press Cake is the residue from the filter presses.

Dilution is the per cent weight on normal juice of the water in the mixed juice.

Extraction is the per cent of the total sucrose in the cane which has been obtained in the mixed juice. As ordinarily used it refers to the direct polarization, rather than the sucrose.

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DESCRIPTION OF APPARATUS.

FOR CANE AND BAGASSE ANALYSIS.

A small *3-Roller Mill* is very convenient for testing field samples of cane, and in the preparation of cane samples for fiber determinations. It is much more satisfactorily driven by power, either from a shaft or by a motor, than by hand.

A small *Feed Chopper,* such as is used for chopping cane tops, is of advantage in fiber determinations both in cane and in field trash.

For preparing cane samples for fiber determinations, the Warmouth-Hyatt *Disintegrator* is very satisfactory because entire sticks of cane can be reduced to a fine state of division with it. On account of the price at which it sells, however, it is usually considered a luxury.

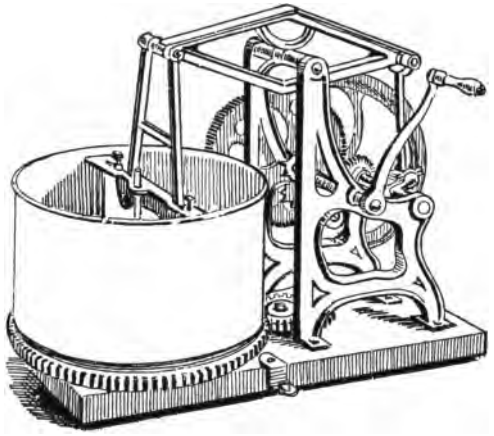

Fig. 1.

Both cane and bagasse samples can be brought to a fine state of division with an Athol *Chopping Machine,* Fig. 1. Only the larger size and heavier machines, with 12-inch cylinders, revolved by gears, are fit for this work. The machine should be bolted to a solid base, and the knife kept sharpened and set down close to the bottom of the cylinder. Either heavy strawboard or sole leather makes good covers for the cylinders.

One of the most indispensable pieces of apparatus in the

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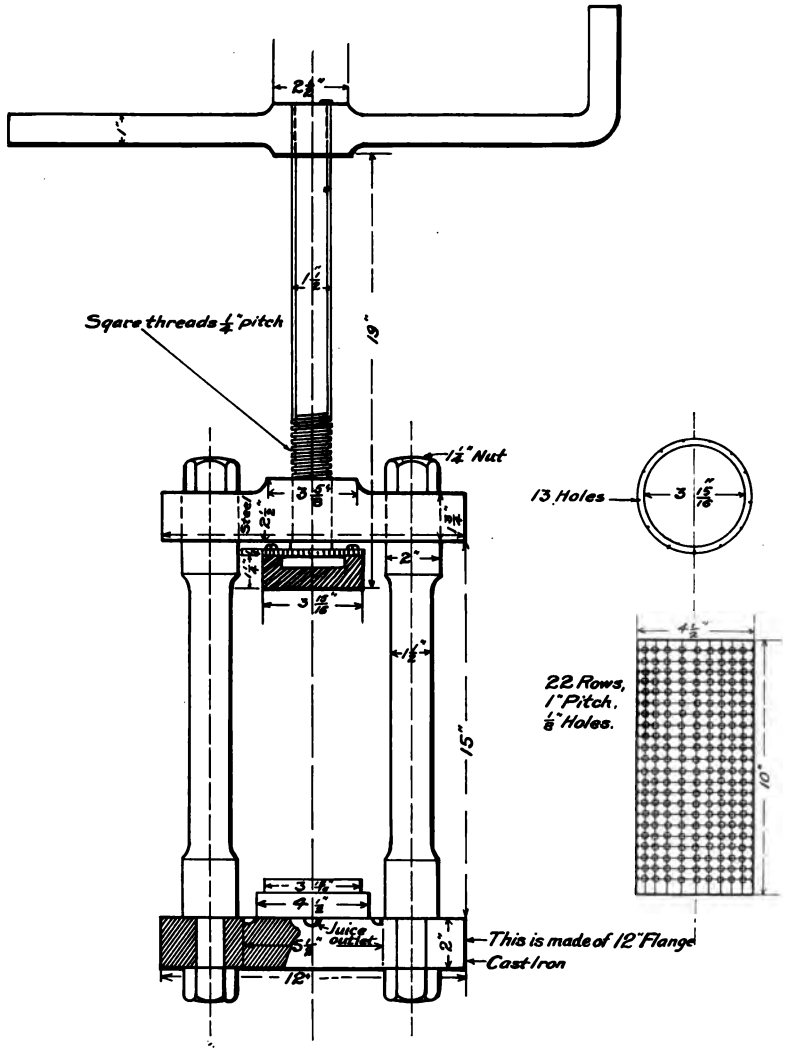

Fig. 2.

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laboratory for the control of the milling is a *Screw Press,* Fig. 2. When the fiber in the cane that is milled varies much, as it generally does, the accuracy of the determinations of the extraction is largely dependent on the frequency of the fiber determinations. With a screw press many more samples can be handled than when the juice has to be washed out without pressure. As a precaution against bending the screw it is well to have it about 2″ in diameter. A hydraulic attachment is of no particular advantage.

In the determination of the sugar in bagasse it is well to express as much as possible of the solution for polarization, after digestion. This can be facilitated by transferring the sample from the digester to a small press. The ordinary *Tincture Press* of small size, to be found on the market, is serviceable for this purpose.

In making fiber determinations in cane, where a disintegrator is not available, a *Meat Slicer* is convenient for cutting the sample up into small pieces, before chopping.

A step farther in the same direction can be taken by using a wood plane fastened with the face upward, and drawing the end of the piece of cane over it. The plane,[1] used by Japanese carcarpenters is a convenient form for this purpose.

There are a number of kinds of *Drying Ovens,* with any of which accurate determinations of moisture can be made if properly used. The advantage of one form over another is a matter of convenience and reliability.

The most convenient, but usually the most expensive to install, is an electric oven. A steady electric current is necessary for satisafctory results with them. They should best have four compartments, with separate doors, three kept at 125° to 130° C. and one at 100° to 105° C. The compartments should be large enough to hold two bagasse drying trays,

The next in convenience are steam ovens, of which there are several forms in use. One very satisfactory form is illustrated in Fig. 3, and described[2] by the inventor as follows:

"The heating chamber consists of a cast iron pipe 16″ diameter by 55½″ long. On each end a ½″ steel plate is bolted which acts as a tube sheet for 37 copper tubes 1½″ outside diameter. The chamber is connected on the side near the bottom with a 2″ steam line at 100 lbs. pressure. A steam outlet on the side near the top is connected into the mill exhaust line. The bottom tube

[1] Greenfield, Record, IX (1913), p. 616.
[2] Horace Johnson, Record, Vol. XIII, p. 8.

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sheet is fitted with a small drain pipe to relieve, from time to time, any accumulation of condensed steam.

"The drying oven sits directly on the top tube sheet of the heating chamber. The bottom of the oven has a round hole cut in it the same diameter as the tube sheet. The oven is divided by partitions into four compartments. Two compartments 10″ wide by 11″ deep and 24″ high open on the respective sides of the oven. Each compartment has three perforated shelves and at the top has five ¾″ vent holes.

"The steam chamber and oven are completely insulated with asbestos lagging. The air enters the tubes at the bottom of the chamber, rises by natural draft through the several compartments of the oven and escapes through the vents at the top of the oven.

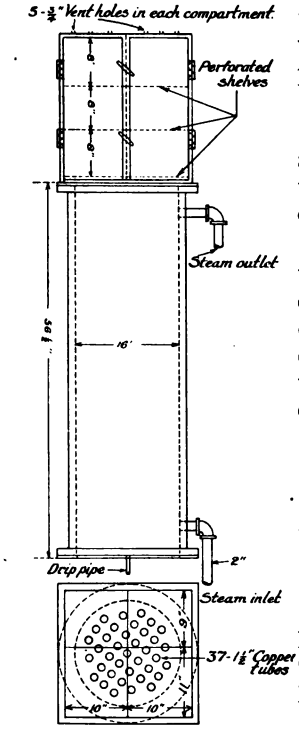

Fig. 3.

"The tubes have a total heating surface of 61.6 square feet, which allows the compartments to be carried at a temperature of 130° C. at the bottom and 110° C. at the top.

"The oven has sufficient capacity for all the routine work in a sugar laboratory, is easily operated and is very efficient."

The high efficiency of this oven is due to the induced current of hot air passing continually up through it. Samples will dry in a much shorter time in such an oven than in another carrying the same temperatures but without the hot air circulation.

The principle of air circulation is still further emphasized in another form of steam oven[3] in which a current of hot air is made to pass through the bagasse or fiber sample, contained in a cylinder with perforated ends, by means of a steam ejector. A very rapid drying is produced in this way. The oven is more complicated in construction than the one previously mentioned.

A simple form of steam oven (Fig. 4) which can be easily constructed in any

[3] G. L. Spencer, Record, Vol. III, pp. 78-80; Jour. Indust. and Eng. Chem., Vol. 11, 1910, p. 254.

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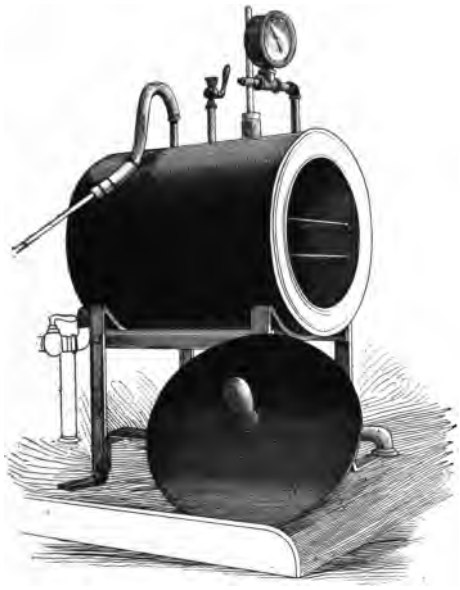

Fig. 4.

machine shop is made from two pieces of large-sized pipe or heavy well-casing. A piece of 9-inch and one of 12-inch pipe, 16 to 24 inches long, threaded at each end to fit a collar, making a steam-eight joint. One end is closed with an iron plate bolted on, and the other fitted with a door which should be fastened on with hinges.

Air baths are the most common form of oven for moisture determinations. They should be made of heavy sheet copper for durability, and be provided with ample ventilation. The latest models on the market (Fig. 5) have four or more holes in the bottom, fitted with short copper tubes, for ventilation with heated air.

All forms of ovens should be covered thoroughly with asbestos, not only to prevent the escape of heat, but to keep the temperature even throughout the oven.

Bagasse Digesters[4] (Fig. 6) can be had separate, with a water pot for each digester, or in sets with a water

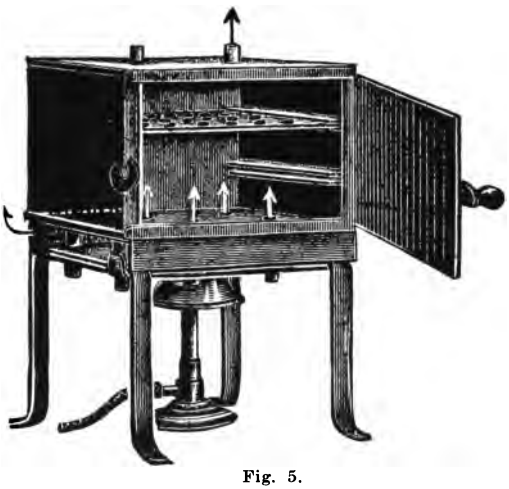

Fig. 5.

[4] Norris, Bulletin 32 (1910), Agric. & Chem. Series, H. S. P. A.; International Sugar Journal, XII, 1910, p. 642.

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bath holding from two to six digesters. The latter will usually be found the most convenient. When ordering, it should be insisted that they are substantially made. It is convenient to have a metal cup holding 500 c. c. for measuring the hot water that is to be added to the sample.

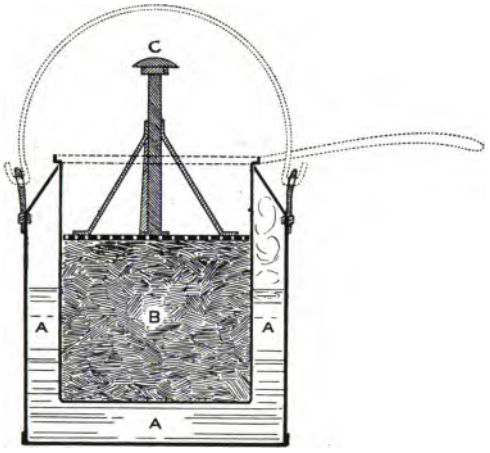

Fig. 6.

Shallow *Trays* should be used for drying bagasse samples, so they can be spread out thin. Experiments show that a bagasse sample 2″ thick takes about three times as long to dry in the same oven as one ¾″ thick.

FOR JUICE AND SUGAR ANALYSIS.

Glass *Cylinders* are preferable to those of metal as it is easier to tell when they are clean and dry. Wide cylinders are also preferable for juice samples to narrow ones, as the hydrometer is less liable to come in contact with the sides in reading, and there is a larger amount of the sample on hand in case it is necessary to repeat the analysis.

Cylinders without a lip are more convenient for hydrometer readings and for connecting with a vacuum, to remove the air.

Two *Cooling Baths* should be provided, one supplied with a constant stream of tap water, for the quick cooling of hot solutions, and another to be kept at the laboratory temperature.

Closed containers, such as bottles or demijohns, should not be used for collecting samples, as they cannot be cleaned inside mechanically.

Heavy sheet copper is the best material for *Sample Buckets*. Such buckets are durable and easily kept clean. They should have close fitting covers, and the seams on the inside filled with solder. For juices the covers should have a 2-inch hole covered with wire screen and surmounted by a funnel. For sugar samples the buckets should be only half the size of the juice buckets,

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and the funnel in the cover have very steep sides to prevent the sugar collecting in it.

Enameled ware buckets are suitable for samples, but are not as durable as copper.

Juice sample buckets should be emptied as soon as the sample is finished, then cleaned, dried, and a few drops of formalin put into them.

Filter Racks[5] for holding the funnels during filtration are an aid to rapid work in polarizing. The form in which the funnels are supported over a trough cut in the top of table or work bench, are the most convenient.

For ovens and water baths the best source of heat is electricity or steam. Where a complete control is carried on heat is required for other purposes also, such as glucose and ash determinations, and this can best be secured from gas made from gasoline, which requires a *Gas Machine* for its preparation. For lower temperatures *Oil Stoves,* preferably of the "blue flame" style, can be used—and gasoline torches for higher temperatures. The ordinary small oil stoves with flat wicks have the advantage of taking up but little space. The American-made stoves are the most durable and give the greatest amount of heat.

The *Polariscope,* or more properly the *Saccharimeter,* is the most important piece of apparatus in a sugar laboratory. The Ventzke type is the one unversally used in Hawaii, the standard of which is 26.048 grams of sugar in 100 Mohr's c. c. of water at 17½° C., or 26 grams in 100 true c. c. at 20° C. This solution in a tube 200 mm. long was supposed to read 100 on the scale of the polariscope, but recent investigation would tend to indicate that it falls a little short of this. It is recommended that beginners in sugar factory control familiarize themselves with the general arrangement and functions of the different parts of a polariscope by reading the descriptions in standard books on the subject.

Two lengths of polariscopes are in common use; 200 mm. and 400 mm. Any plantation ordering a new polariscope should get one of the greater length. The advantage in the analysis of such an important product as bagasse will alone compensate for the small difference in price.

They can be had with double field or triple field of vision. The latter is the more sensitive, but easily gets out of adjustment in

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[5] A. Krafft, Record, Vol. III (1910), p. 285; Norris, La. Planter, L. (1913), p. 96.

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tropical climates, and for that reason the double field is preferable for use on plantations.

As all recent instruments are made to read up to 30 on the left side of the scale, there is no advantage for the usual control work in the double set of compensating wedges, with which some instruments are furnished.

In reading a sugar solution in the polariscope the round luminous field is first made clear and the vertical line or lines sharply defined by moving the telescope in or out, and then brought to an even shade throughout by turning the screw underneath. The scale is made up of two parts, the shorter of which, the vernier, remains stationary. The reading is taken at that point on the scale that is opposite the zero of the vernier. The whole number can be read off directly. For the fraction, note the line on the vernier to the right that coincides with any line on the scale. In Fig. 7 it is the fourth line from the zero. The whole number is 54, and the reading, therefore, 54.4.

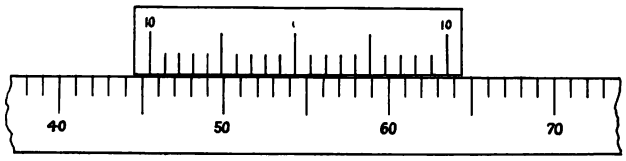

Fig. 7.

Polariscopes are now furnished with a cell for potassium bichromate solution, for removing certain objectionable rays of light. These are usually three centimeters in length, and should be kept filled with a filtered 3% solution of the bichromate.

The trestle form of support is better than the tripod form since it gives stability to the polariscope and prevents the accidental changing of the relative position of the polarizer end of the instrument and the light, which affects the zero point and consequently the reading.

The brightest light for the polariscope is that from *Acetylene;* the most convenient is an electric light. Instruments are now furnished with a small electric light in the end, but just as convenient an arrangement can be made with a *Tungsten Stereoptican Lamp,* placed behind a screen with a vertical oblong hole in it half an inch wide and two inches long. Ordinary tungsten lamps can be used, but do not give as bright a light. A ground glass screen in front of the polariscope is necessary with any electric lamp. A very finely ground glass in the front end of the polariscope is best for this purpose. It is essential in using

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an electric current for lighting that it shall be steady, as a variation will affect the readings. In case the current that is available is uneven it is best to use a storage battery for the polariscope lamp, to be charged by a *direct* current from the regular circuit.

There is danger of injuring the polariscope by placing the source of light too near it, especially with oil lamps, which give off a large amount of heat. Place the light first about six inches from the end and then have it moved to and from the polariscope while the eye is held at the eye-piece until the point is found from which the greatest light is obtained. This position is then marked so that the lamp can always be kept at the proper distance. The light should be extinguished when not in use, to avoid heating the polariscope. It is best to have the source of light outside of the room or hood that contains the polariscope.

In all polariscopes, but especially those with tripod stands, the zero reading should be taken and the scale set if necessary with the key that is always provided for that purpose, before each series of readings. The upper end of the scale ought also to be tested occasionally with a *Quartz Plate*.

Polariscopes that are out of adjustment should be sent to the Experiment Station for examination. There is considerable risk of permanent injury if a polariscope is taken apart by anyone unfamiliar with its construction.

Glass *Polariscope Tubes* are preferable to those of metal for the same reason as given under cylinders, and also because there is more certainty of their remaining the right length.

Two hundred millimeters is the standard length for polariscope tubes. When reading dilute solutions, as in polarizing bagasse and press cake, it is preferable to use a 400 mm. tube. Very dark solutions can sometimes be read only in a 100 mm. tube. It is well therefore to have a supply of the three lengths of tubes.

Polariscope tubes should be frequently examined to see that they are in good condition. Errors of several tenths of a per cent in the reading may be caused by tubes being out of order. The most frequent cause of errors is the metal end pieces of tubes with screw caps having been pulled beyond the ends of the glass tube. For that reason tubes with sliding caps are preferable. The glass should project very slightly beyond the metal ends. To further examine the tubes, fill with clear distilled water, place in the polariscope and turn with the finger while observing the field. The scale should continue to read zero, and the tube opening should remain steady in the

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center of the field. If it wabbles the metal ends are not mounted evenly, or the ends of the tube or the face of the cover glasses are not plane parallel. Separate the tubes whose openings appear to wabble, and test them again with the cover glasses from the good tubes. If any of them do not wabble on the second test it shows that the fault was with the cover glasses first used, which should be tested again in different combinations and the faulty ones thrown away. If any of the tubes read more or less than zero their cover glasses should be put aside and tested again in the same way in a day or two. Those that are still active should be discarded. Scratched glasses should not be used; the scratches frequently come from using a glass or metal rod for removing them from the covers, instead of one of wood or other soft material. Any tubes whose openings appear to wabble in the polariscope with cover glasses in good condition should not be used. Tubes that are apparently out of order should be sent to the Experiment Station for examination and possible repair.

The rubber washers should also be examined. If much worn or placed unevenly in the caps, they may cause the tubes to show an optical activity.

The polarization after inversion should always be read in a jacketed tube on account of the marked effect on the reading of slight differences in temperature.

The continuous polariscope tube is not as practicable for factory use as the individual tubes, on account of the variation in the density of solutions to be polarized.

Scales and *Balances* are very liable to lose their sensitiveness quite rapidly in this country owing to the rusting of the steel bearings. There is a great advantage, therefore, in having the knife edges and bearings made of agate. Chemical balances are only necessary for analyses requiring the weighing of very small amounts of material, which are not undertaken in the smaller factories. Aside from the chemical balance, two other kinds of scales are necessary in carrying on a control—one for weighing samples of sugar, massecuite, press cake, etc., and another for cane, bagasse, etc. These are preferably both of the type known as pulp balances, as they are more sensitive than scales of the "Robervahl" and "Harvard" type.

Scales of all kinds should be tested empty several times a day and kept in balance.

Weights that are in frequent use should be tested at least once a year with the smaller, less used weights of the same aggregate value, and if light brought back to normal with strips of tin foil placed under the stem that screws into the top. Nor-

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mal sugar weights should be tested on a chemical balance, and be kept within 1 mg. of the correct weight. The tare weight used with sugar dishes should be balanced against the empty dish frequently, on a chemical balance, and kept in close agreement with it by filing off the bottom.

A *Laboratory Centrifugal Machine* or *Magma Separator* is required for a careful control of the sugar boiling and crystallization.

The *Brix Hydrometer* is the most convenient instrument for determining the density of sugar solutions. Its scale shows directly the per cent sugar in any pure sugar solution, at its standard temperature. In impure solutions the readings are a little higher than the true total solids.

Hydrometers usually come with a range of five, ten, twenty, or thirty degrees. When they have a wide range, like the last two mentioned, the divisions are so small that it is difficult to read them accurately. The smallest divisions should be at least 1/16-inch. In order to get large divisions the bulb must be large and the stem small. At least one inch diameter in the bulb, and not over 3/16-inch diameter in the stem is recommended; and, the range from the top to the bottom of the stem should not be over ten degrees. It is an advantage to have the readings of the different spindles overlap, as 0-6°, 5°-11°, 10-16°, etc., since the graduations are more liable to be incorrect right at the end of the scale. For convenience, also, the spindles should always be provided with thermometers.

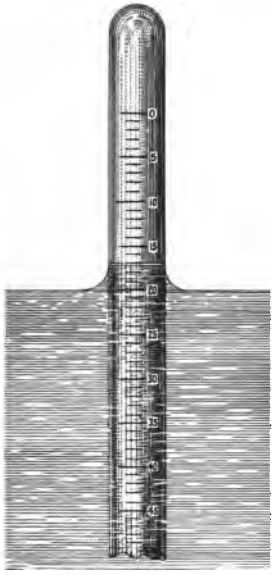

Fig. 8.

In reading the Brix of a solution the mark on the spindle that is opposite the level of the liquid should be taken, not the top of the liquid in contact wit hthe stem. In Fig. 8 the reading is 20, not 17. Care should always be taken before immersing the spindle in the solution to see that it is clean, especially at the point at which it is to be in contact with the surface of the solution.

Manufacturers of hydrometers have not been very successful as yet in making them accurate. They

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should therefore always be tested. The Experiment Station makes a practice of testing hydrometers and furnishing certificates showing the corrections, if any, to be applied to the readings. The checking may be done in any laboratory provided with a chemical balance, accurate weights, a pycnometer and an accurate thermometer; using Table No. 1 for finding the Brix corresponding to the density as determined.

The *Mohr Balance* is convenient for determining densities, when only a small amount of solution is available. It should be tested against a pycnometer before using, and give a reading of 1.0000 with water at 27½°C.

The most accurate method for determining densities, or the degrees Brix, of solutions is by comparing their weights with equal volumes of water. This can be most readily done with a *Pycnometer,* of which there are several different forms. One form well suited to accurate work with sugar solutions has a thermometer, ground in for a stopper, and a capillary side tube.

To use a pycnometer, the weight of water it holds at the desired temperature must first be determined. To do this remove the thermometer and clean the pycnometer with a hot solution of chromic acid in sufuric acid (see Re-agents), rinse thoroughly with distilled water and dry in an air bath. After cooling, weigh the pycnometer empty and then filled with distilled water that has been recently boiled to expell the air, the thermometer being in place each time. The water should first be brought to exactly 27½°, and the empty pycnometer likewise immersed in water for a few minutes at this temperature before filling. For this calibration of the pycnometer it is best to select a time when the laboratory temperature is not over 27° C., and preferably 25° to 26° C. The weight is taken twice again with water, and the average of the three determinations used for density determinations.

The density of any solution may now be determined by repeating the test as above described, using the solution in place of water. The weight of the solution divided by the weight of water gives the density. The corresponding Brix can be found from Table No. 1.

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Example:

Weight of pycnometer empty	31.3462
" " " plus water at 27½° C.	81.5322
" " water	50.1860
" pycnometer plus solution at 27½° C.	88.2772
" " solution	56.9310

$$\frac{56.9310}{50.1860} = 1.13440 \text{ sp. gr., } = 31.26 \text{ Brix.}$$

The following method will be found advantageous when the pycnometer is used regularly for determining the Brix of juices and other solutions:

Use a 100 c. c. pycnometer with ground-in thermometer and capillary side arm—since filling and weighing are both done at room temperature, no allowance for expansion need be made, and the side arm is best cut off a few millimeters above the graduation mark.

From a small glass bottle weighted with shot or sand, prepare a tare to balance the empty pycnometer.

Fill pycnometer to the mark with distilled water, note temperature and weigh. To indicate 1.000 density with pure water at 27½° C., the weights required to balance the water should be, of course, 100.00 grams. At any other temperature the weight of water should be $100.00 \times \frac{\text{Dens. water t°}}{\text{Dens. water 27½°}}$. The following table gives the weight of water at temperatures from 20° to 34°, which should be contained in a pycnometer in order to indicate directly density as compared with water at 27½°:

	grams		grams		grams
20°	100.18	25°	100.07	30°	99.93
21	100.16	26	100.04	31	99.90
22	100.14	27	100.01	32	99.87
23	100.12	28	99.99	33	99.83
24	100.09	29	99.96	34	99.80

If the weights (in addition to tare) required to balance pyncometer and water do not correspond to the above at any given temperature, simply add to or subtract from tare until they do. The pycnometer and tare are now correct at 1.000 density, and approximately correct at other densities.

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At densities greater than 1.0000 the following must be *subtracted* from the observed weights for each gram previously *added* to the tare, in order to get the true density:

Weights used. grams	Correction. grams	Weights used. grams	Correction. grams
100	0.00	110	0.10
101	0.01	120	0.20
105	0.05	130	0.30

These corrections should, of course, be *added,* in case the original tare had to be reduced in weight.

Example of pycnometer calibration:

Weight pycnometer	.....	47.40
" "	plus water at 29°	146.93
" water	. . ..	99.53

That volume of water which at 27½° weighs 100.00 grams should weigh at 29° 99.96 grams; therefore the tare should be made equal to weight of pycnometer *minus* (99.96 — 99.53 =) 0.43 grams, or 46.97 grams.

Correction to be *added* to weights at different densities:

Weights used. grams	Correction. grams	Weights used. grams	Correction. grams
100	0.00	115	0.06
101	0.004	120	0.09
102	0.009	125	0.11
105	0.02	130	0.13
110	0.04	...	....

In case it is desired to use this pycnometer for solutions of always the same approximate density, the correction for that density may be incorporated in the tare; thus, if the above pycnometer were intended for use with juices of about 15 Brix, or 1.06 density only, the tare should be made 0.02 gram lighter than for pure water, or 46.95 grams instead of 46.97 grams, and no correction need be made to observed weights.

Example of Brix determination with this pycnometer:

Weight pycnometer filled with juice = tare plus 105.32 grams; temperature = 30° C.

Weight correction at 105 grams = 0.02 gram.

Brix corresponding to 1.0534 density $\left(\frac{27\frac{1}{2}^\circ}{27\frac{1}{2}^\circ}\right)$ = 13.25.

Brix correction at 30° + 0.19. Corrected Brix = 13.44.

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Refractometers are not recommended for determining the total solids in solution for control work, but they are well adapted for an approximate determination of the Brix on small samples and in a minimum of time.

Volumetric glassware is required for several purposes in a sugar laboratory, in the form of *Graduated Flasks* and *Cylinders*. Flasks are made especially for sugar work, with two graduations on the neck (i. e., 100 — 100 c. c.), called *Sugar Flasks*. These are used in determining the polarization of all products in the factory. They are not required in juice analyses, when dry sub-acetate of lead is used for clarification.

Volumetric flasks should be calibrated before using. This can be done most conveniently with a standard pipette, which may be obtained in the local market. The pipette is first cleaned with the chromic-sulfuric acid solution mentioned above. Flasks to be tested should be rinsed out with water and dried. The pipette is filled to the mark with clear tap water of the same temperature as the laboratory, and the water transferred to the flask by allowing it to run out freely from the pipette, and then touching the surface of the water in the neck of flask with the end of the pipette and immediately withdrawing it. If the mark on the flask is not in the correct place, as indicated by the height of the water at the bottom of the meniscus, Fig. 9, a small mark is made, with a pencil used for marking on glass, where the correct mark should be and a permanent mark made with a file after removing the water.

The standard of volume adopted by this Association is a true cubic centimeter,—the volume occupied by 0.99538 grams of water at 27½° C., weighed in the air with brass weights. All volumetric apparatus should be graduated in accordance with this standard.

The normal weight of sugar corresponding to this standard of volume is 26.00 grams.

Glass *Precipitating Jars* are generally used for receiving the filtered solutions for polarizations. They are convenient for filtering into and for pouring the filtered solution into the polarization tubes, and can easily be made clean and dry. The 6-ounce jar makes the most convenient size.

The funnels used for filtration should have no stem whatever. In this form they can be easily dried throughout. It is con-

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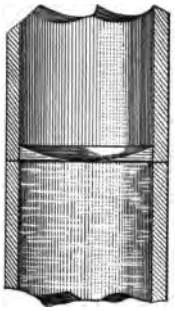

Fig. 9.

venient to have them 4″ (10 cm.) in diameter, in order to hold the entire contents of a 110 c. c. flask.

White *Filer Paper* is preferable to the cheaper gray paper, because it filters more rapidly. To fit the 4″ funnels, the papers should be 7″ (18 cm.) in diameter.

All *Pipettes* should be tested before using, by weighing the water they deliver in a covered beaker on a chemical balance. Freshly distilled water, free from air, and at the laboratory temperature, which is to be noted accurately, is used for this purpose. The method of emptying the pipette was described above, under calibration of volumetric flasks. The weight of 100 c. c. of pure water at different temperatures is given in Table No. 11.

Sucrose Pipettes are convenient for the polarization of juices, but are very liable to error unless great care is taken in working with them. For that reason they are not well adapted for general use in the factory laboratory. The stem of the pipette is graduated to correspond with the Brix of the solution, and if a mistake is made in reading the Brix this will produce an error also in the polarization. As found on the market, they are graduated for delivering a double normal weight (52.096 grams) of solution under the Mohr cubic centimeter standard, when used in connection with the uncorrected Brix as shown by a hydrometer standardized at 17½° C. They may be used under other standards by recalibrating. This can best be done by weighing samples of sugar solutions of different densities delivered from the pipette in the usual way, and determining the point on the stem from which a double normal weight is delivered. For the true cubic centimeter standard this weight should, of course, be 52.00 grams. The Brix of the solutions must previously be accurately determined.

APPARATUS REQUIRED.

A list of apparatus necessary for the chemical control of a cane sugar factory cannot be given to suit all conditions. The requirements depend somewhat upon the conditions under which the chemist has to work, and the completeness and accuracy of the results expected. Two lists are here given, which may be taken as (A) the minimum equipment desirable and (B) that which would be found in a well equipped laboratory.

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(*A*) *Apparatus.*

One Athol chopping machine with gear drive, 12″.
One screw press, with 2″ screw.
One copper air bath, with two shelves 10″x12″x12″ high.
Two bagasse digesters.
Four copper drying trays, 5½″x8″x¾″ deep.
One wooden cooling bath for juice cylinders 15″x18″x15″ deep, with overflow 14″ from bottom.
Two 3-gallon galvanized iron pails, with covers.
Six 1-gallon galvanized iron pails, with covers.
Six glass cylinders 2½″x15″.
One glass cylinder, graduated, 500 c. c.
Two sets Brix hydrometers, with thermometers, 0°—80°, in tenths, at 27½° C.
One 200 mm. polariscope.
One polariscope lamp.
Six glass polariscope tubes 200 mm.
One glass polariscope tube 100 mm.
Twelve extra rubber washers for polariscope tubes.
Twelve extra cover glasses for polariscope tubes.
One pulp scale with 6″ pans, capacity one kilo, sensitive to 1/10 gram, with weights 1 centigram to 500 grams.
One pulp balance in case, with 3″ pans, capacity 200 grams, sensitive to 1 milligram.
One normal sugar weight, 26 grams.
One sugar weighing dish.
Twelve test tubes ⅝″x6″.
Twelve sugar flasks 100 c. c. to 110 c. c. (true), (or six sugar flasks 100 c. c. to 110 c. c. and twelve Erlenmeyer flasks 250 c. c.).
Two sugar flasks 200 c. c. to 220 c. c. (true).
Two sugar flasks 50 c. c. to 55 c. c. (true).
Twelve stemless glass funnels, 4″.
Twelve precipitating jars, 6 oz.
One Krafft filtering rack.
Six packages round filter papers 18 cm.
Two 1-gallon syphon bottles.
One dropping bottle for ether.
One pipette 1 c. c.
Two pipettes 5 c. c.
One volumetric flask 500 c. c.
One procelain mortar 4¾″, with pestle.
One-half pound glass tubing, assorted, small sizes.
Two feet rubber tubing 3/16″.

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Twelve linen bags 6″x10″.
Two heavy canvas bags, 8″x15″.
One cane knife.
Six metal teaspoons.
One copper tube 6″ long, with wooden plug for sampling press cake.
Two 2-burner oil stoves, American.
One 1-burner oil stove, American.
Two juice strainers.

Chemicals.

Ether, sulfuric, tech. 1 lb.
Formalin (40%), 10 lbs.
Lead sub-acetate solution, 54° Brix, 1 gallon (or lead sub-acetate dry, powdered, 2 lbs.).
Litmus paper, blue and red, one box each.
Potassium bichromate, tech., 1 lb.
Sulfuric acid, conc, tech., 2 lbs.
Sodium carbonate, cryst. (washing soda), 3 lbs.

(*B*) *Apparatus.*

One small 3-roller cane mill.
One feed chopper.
Two Athol chopping machines, with gear drive, 12″.
One screw press, with 2-inch screw.
One tincture press, with 1¼-inch screw.
One meat slicer.
One steam oven with four compartments, carrying 130° C. temperature.
One copper air bath 10″x12″x12″, (or one electric oven 12″x12″x12″).
Two cane knives.
Six bagasse digesters.
One copper cup, with long handle, 500 c. c.
One steam-heated water bath with six holes in top, for bagasse digesters.
Two wooden cooling baths for juice cylinders 12″x18″x15″ deep and 18″x24″x15″ deep, with overflow 14″ from bottom.
Eight copper drying trays 5½″x8″x¾″ deep.
Three 5-gallon cylindrical copper buckets 10″ diameter, 16″ deep, with covers.
Twelve 1-gallon cylindrical copper buckets, with covers.

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Three half-gallon copper buckets, with covers.
Six 1-quart copper cups.
Twelve 2-quart mason jars, with covers.
Six metal teaspoons.
Six metal tablespoons.
One improved Krafft filtering rack.
One fuel-gas machine.
Six Bunsen burners for gasoline gas.
One 400 mm. polariscope, electric-lighted.
Six glass polariscope tubes 400 mm.
Twelve glass polariscope tubes 200 mm.
Three glass polariscope tubes 100 mm.
One jacketed inversion polariscope tube 200 mm., with thermometer.
One quartz testing plate, reading about 96°.
Twelve rubber washers for polariscope tubes.
Twenty-four cover glasses for polariscope tubes.
Twenty-four glass cylinders, 2½″x15″.
Two glass cylinders, 1½″x15″.
One glass cylinder, graduated, 100 c. c.
One glass cylinder, graduated, 250 c. c.
Two glass cylinders, graduated, 500 c. c.
One glass cylinder, graduated, 1000 c. c.
One pulp scale with 6″ pans, capacity one kilo, sensitive to 1/10 gram, with weights 1/10 gram to 500 grams.
One pulp balance in case, with 3″ pans, capacity 200 grams, sensitive to one milligram.
One chemical balance, capacity 200 grams, sensitive to 1/10 milligram, with weights 50 grams to 10 milligrams.
One set normal sugar weights, 13, 26, and 52 grams.
Two nickel sugar weighing dishes.
One camel's hair brush, flat, 1″.
Three double watch glasses, with clips 2½″.
Twelve aluminum drying dishes, with lids, 7 cm. in diameter.
One platinum ash dish.
Three nichrome triangles, 5 cm.
One 50 c. c. or 100 c. c. pycnometer, with thermometer and capillary side tube.
Three desiccators, 4″.
Three chemical thermometers 150° C.
Two wash bottles, 1 liter.
Thirty-six test tubes 6″x¾″.
Brix hydrometers, with thermometers graduated in tenths at 27½° C.:

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Three	0 — 6°	Two	40°—50°
Two	5°—11°	Three	50°—61°
Four	10°—16°	Four	60°—71°
Four	15°—21°	Two	70°—80°
Three	20°—31°		

Thirty-six sugar flasks 100 c. c. to 110 c. c. (true), or twelve sugar flasks 100 c. c. to 110 c. c., and twenty-four Erlenmeyer flasks 250 c. c.).

Three sugar flasks 200 c. c. to 220 c. c. (true).
Three sugar flasks 50 c. c. to 55 c. c. (true).
Thirty-six stemless glass funnels, 4".
Two glass funnels 6".
Two glass funnels 8".
Thirty-six precipitating jars, 6 oz.
Twenty packages round, white, filter papers 18 cm. diameter.
Three 5-gallon syphon bottles for lead solution and water.
Two dropping bottles, "TK," for ether.
One refractometer, for sugar.
One pipette, 10 c. c., graduated.
Two pipettes 1 c. c. (true).
Three pipettes 5 c. c. (true).
Three pipettes 50 c. c. (true).
Three pipettes 75 c. c. (true).
One pipette 100 c. c. (true) standard, for testing volumetric ware.
Six volumetric flasks—

Two 250 c. c. (true).
Two 500 c. c. (true).
Two 1000 c. c. (true).

Three burettes, 50 c. c. in 1/10 c. c. (true).
One burette stand, wooden.
One porcelain testing plate.
Three porcelain evaporating dishes 4".
Two porcelain casseroles 125 c. c.
Six porcelain Gooch crucibles, 25 c. c.
Twelve Griffin beakers, 400 c. c.
One brass Bunsen filter pump.
Two glass filtering bulbs.
One 2 min. sand glass.
Two porcelain mortars, 4¾", and pestle.
Thirty-six bottles, wide mouth, round, 4-oz.
Twelve reagent bottles for liquids, 250 c. c.

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Hydrochloric Acid, conc.
Nitric Acid, conc.
Sulfuric Acid, conc.
Amonium hydroxide.
Ammonium chloride.
Ammonium oxalate.
Barium chloride.
Lead acetate.
Sodium hydroxide.
Blank (3).

One dozen watch glasses, 4″ diam.
One pound assorted glass tubing.
One quarter pound glass rods, small.
Twenty-four linen bags, 6″x10″.
Six heavy canvas bags, 8″.
Two Mohr pinchcocks, medium.
One paid pliers, 6″.
One pair shears, 6″.
Three triangular files, 6″.
One pair crucible tongs, 9″.
Two wire beaker clamps.
Three asbestos boards, 6″x6″.
One test tube rack.
One copper tube 6″ long, with wooden plug for sampling press cake.
Three juice strainers.
Rubber tubing; three feet each of 3/16″, ¼″ and ⅜″.
Rubber tubing, heavy wall for gas burners, 9 feet.
Two pounds rubber stoppers, assorted.
One gross corks, assorted.
One set cork borers.
One book gummed labels.

Chemicals.

Hydrochloric Acid, C. P. 1 lb.
Nitric Acid, C. P. 1 lb.
Sulfuric Acid, C. P. 9 lbs.
Alcohol, ethyl, 95%, 1 qt.
Alpha-naphthol, 1 oz.
Ammonium hydrate, C. P. 4 lbs.
Ammonium chloride, C. P. 1 lb.
Ammonium oxalate, C. P. 1 lb.

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Asbestos, for Gooch crucibles, 1 lb.
Barium chloride, C. P. ¼ lb.
Calcium chloride, granular, for desiccators.
Copper sulfate, C. P. 1 lb.
Ether, sulfuric, tech. 2 lbs.
Formalin (40%), 1 bbl.
Lead acetate, tech., 25 lbs.
Lead sub-acetate, dry, powdered, 10 lbs.
Litharge, tech., 5 lbs.
Litmus paper, blue 3 boxes, red 1 box.
Phenolphthalein, 1 oz.
Potassium ferrocyanide, C. P. ¼ lb.
Potassium oxalate, C. P. 1 lb.
Potassium bichromate, tech., 2 lbs.
Silica sand, fine, 5 lbs.
Sodium carbonate, cryst. (washing soda), 5 lbs.
Sodium hydrate, sticks, C. P. 5 lbs.
Sodium potassium tartrate, 5 lbs.
Vaseline, 1 small bottle.
Zinc dust, ½ lb.

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PREPARATION OF REAGENTS.

Neutral Lead Acetate Solution.

Dissolve 250 grams of lead acetate in about 500 c. c. distilled water, filter and dilute up to 54 Brix with distilled water.

Lead Sub-acetate Solution.

Boil together for half an hour a mixture of 3.3 kilos of lead aetate, one kilo of litharge and five liters of tap water. Allow to settle and decant off the clear solution. For use, dilute with water to about 54 Brix.

Alumina Cream.

To a saturated solution of alum in water (about 15 parts to 100), add ammonia water to slight excess. Allow to settle and wash with water by decantation until the odor of ammonia is no longer perceptible.

A few cubic centimeters of the cream, suspended in water, is used in conjunction with the subacetate of lead in producing a good clarification of samples.

Sodium Carbonate Solution.

For use in bagasse analysis to make a 5% solution dissolve 135 grams of commercial carbonate of soda crystals (washing soda) in water and make up to one liter. Or it may be conveniently kept on hand in the form of a solution of 1350 grams to the liter and one part diluted up to ten with water for use.

Soxhlet's Solution, for Glucose Determinations.

In order to prevent this solution from deteriorating its two constituent solutions are kept saparate. They are mixed in equal proportions immediately before use.

(a) Copper sulfate solution: Dissolve 34.639 grams of chemically pure crystals of copper sulfate in distilled water and make up to 500 c. c.

(b) Alkaline tartrate solution: Dissolve 173 grams of Rochelle salts C. P. and 50 grams of sodium hydrate C. P., in distilled water and dilute to 500 c. c.

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Potassium Oxalate Solution.

For use in deleading sugar solutions for the glucose determination, dissolve 92 grams of neutral potassium oxalate in distilled water and make up to 500 c. c. This makes a double normal solution, approximately.

Phenolphthalein Solution.

Dissolve one gram of phenolphthalein in 100 c. c. of a mixture of equal parts of 95% alcohol and distilled water.

Alpha-Naphthol Solution.

Dissolve five grams of powdered alpha-naphthol in a few cubic centimeters of ethyl alcohol and make up to 25 c. c. with the alcohol. Keep in a brown glass-stoppered bottle, and make up a fresh solution once a month.

Cleaning Solution.

The following solution will be found very efficient for cleaning glassware. It is much more effective in hot condition than when cold, but should not be heated to too high a temperature or too long, on account of self-decomposition.

Dissolve 60 grams of potassium bichromate in 300 c. c. water, and add 460 grams concentrated sufuric acid slowly, with constant stirring.

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WEIGHTS AND MEASUREMENTS.

It should never be lost sight of that correct weights or measurements of the raw and the finished products are quite as important to a satisfactory control of the manufacture as the laboratory results.

Cane. The scales for cars or wagons should be balanced empty several times a day and tested once a week, at the average weight of a full load of cane, with standard weights or a known weight of material that has been weighed on an accurate scale of smaller size. Bags of sugar are convenient for this purpose.

The weights of empty cars or wagons should best be taken each time they are unloaded, and for that purpose an extra scale is convenient.

Mixed Juice. Since the weight of mixed juice is the starting point in the control, special precautions should be taken to see that it is correct.

It is much better to weigh the juice than to measure it. Two forms of juice scales are in use,—automatic and beam scales with suspended tank. Both forms should be balanced empty at least once a day, and should be tested at the beginning of each season by weighing a full load of water into them. Automatic scales should also be inspected several times a day to see whether they are dumping and recording properly. The recording device on beam scales is an advantage in securing correct weights, as is also, as an additional check, an automatic counter to record the number of times the scale tank has been filled. The scale tanks should be washed down with a fine stream of water about every three hours. The per cent of insoluble matter in the juice should be determined by diluting a sample, collected as it enters the scale, with clear water one to ten, filtering through a weighed filter paper, drying at 105° C. and weighing. This should be deducted from the weight of the juice.

If scales are not provided for weighing the juice it should be measured in the liming tanks. These should preferably be of such a size as to hold from fifteen to thirty minutes' supply of juice, up to an overflow pipe connecting the tanks. The measuring tanks should not be directly connected to the juice pump, but discharge into another tank from which the juice is pumped. The discharge valves should be in plain sight so that any leak will be noticed. To calibrate the tanks, water from a barrel on a platform scale is weighed into them up to the overflow, its tem-

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perature taken when the tank is full, and the number of gallons computed. The weight of a gallon of water at different temperatures is given in Table 3. To allow for the volume of air that is contained in the juice, a tank filled in the usual manner is allowed to stand for an hour, and the contraction noted from the lowering of the level of the juice. The temperature of the juice at the beginning and end of the test must also be taken, in order to deduct the contraction due to lowering of temperature from the total contraction. This test had best be made at some time when the mill is temporarily not in operation.

When the juice is measured its temperature must be taken, and the Brix it would have at this temperature used in calculating the weight. The volume of the milk of lime used, and that of the insoluble matter must also be deducted.

Press Cake. When the presses are emptied into cars, provision should be made for weighing the press cake by the carload as it is produced.

An approximate weight can be obtained by weighing the entire cake from a representative press occasionally, on a platform scale. The number of times this had best be done will depend on how much the cake varies in amount.

A still less accurate method for getting at the weight is to weigh one representative cake from a press, and calculate the weight of the entire cake from it.

Condenser Water. The water passing through a condenser can be most accurately measured by means of a meter in the supply pipe or through a weir in the discharge flume. These are, however, not usually provided, so it becomes necessary to measure it indirectly when required. To determine approximately the amount of water leaving the condenser, find the average temperature in degrees centigrade of the water entering, and of that leaving the condenser. This can be done most accurately with recording thermometers and a planimeter. In lieu of these the temperatures may be taken at short intervals of time with a chemical thermometer. From the temperatures, the weight of condenser water corresponding to a unit weight of water evaporated from the juice can be found from Table 8. The table is calculated for single-effect evaporators; the corresponding figures for multiple-effect evaporators can be obtained by multiplying in each case by the percent. evaporation in the last body. This may be taken on an average as approximately:

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52 percent for double effects
35 " " triple effects
28 " " quadruple effects
23 " " quintuple effects

This number multiplied by the percentage evaporation, calculated by the formula—

$$\text{Per cent evaporation (by weight)} = \frac{\text{Brix of Syrup} - \text{Brix of Clarified Juice}}{\text{Brix of Syrup}}$$

gives the weight of condenser water corresponding to unit weight of juice entering the evaporator, which latter may be assumed to be equal to the weight of mixed juice. This weight for a period of twenty-four hours, multiplied by the result just calculated, gives the weight of condenser water per day. For example, with a quadruple effect, suppose we have:

Temperature of water entering condenser.....	20° C.
Temperature of water leaving condenser.....	44° C.
Brix of Clarified Juice.....	14.7
Brix of Syrup.....	62.0
Weight of mixed juice in one day.....1,200	tons

Using these figures, we find from the table that there are 7.1 pounds of condenser water for each pound of water evaporated from the juice. The evaporation, calculated from the formula, is 76.3 per cent. We therefore have $7.1 \times 0.763 = 5.4$ pounds of condenser water for each pound of juice. The weight of mixed juice being 2,400,000 pounds, the condenser water for twenty-four hours will weigh $2{,}400{,}000 \times 5.4 = 12{,}960{,}000$ pounds.

In place of the above method, the weight of condenser water per unit weight of water evaporated from the juice may be roughly calculated by the formula,—$E \times \left(1 + \frac{c - t_2}{t^2 - t^1}\right)$ in which

E = Proportion of total evaporation by the last body.

t^1 = Temperature, ° C., of incoming water.

t^2 = Temperature, ° C., of outgoing water.

C = Heat of vapor, in calories. For different vacuums this is as follows:

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Inches.	Calories.
22	626
23	624
24	623
25	621
26	619
27	617
28	613

Owing to the variation in the evaporation in vacuum pans, the weight of water used in their condensers cannot be so accurately determined as in the case of evaporators, by the method just described, unless great care is taken in determining the average temperature of the water leaving the condenser during a strike and of th Brix of the syrup or molasses and the massecuite.

Commercial Sugar. When the sugar for the market is weighed on an automatic scale, the weight should be checked on a platform scale, especially at the beginning of a strike.

Platform scales should have frequent attention in the matter of cleanliness. The weight on the end of the beam should be washed in warm water once a day, and the beam should also be washed off at the same time. The platform should be kept clean by scraping and occasionally washing.

Platform scales should be balanced empty, and tested occasionally with a standard 125-pound weight.

It is advisable, where it is possible to arrange it, to check the weight of sugar by weighing the cars in which it is loaded.

Molasses. The weight of the final molasses should be obtained with a beam scale. It is especially important that the empty weight should be taken and recorded each time before filling.

The molasses scale should be tested at the beginning of the season with water, in the same way as the juice scale.

The weights of molasses calculated from measurements in tanks can only be considered as very rough approximations.

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ANALYSIS.

CANE.

Field Trash.

The field trash should be determined on one or two cars of cane a day or as often as it is feasible.

To determine the amount of field trash, weigh an average car of cane, separate the trash from it, weigh the clean cane and determine the loss on the total weight of cane. The per cent. of fiber in this field trash is determined in the same way as described below under clean cane, after chopping all of it in a feed chopper, mixing and reducing about 500 grams of it to a fine state of division in an Athol chopping machine. About 50 grams of the fine sample are used for the determination. The fiber found is added pro-rata to that in the clean cane, to get the fiber in gross cane, as follows:

Field trash	2.6%
Clean cane	97.4%
Gross cane	100.0%
Fiber in field trash	54.2%
Fiber in clean cane	11.6%

$$2.6 \times 0.542 = 1.4\%$$
$$97.4 \times 0.116 = 11.3\%$$
$$\text{Fiber in gross cane} = 12.7\%$$

On fluming plantations the per cent. of trash is found by selecting a representative section of cane in the storage flume, aggregating several hundred pounds, weighing the gross cane, separating the trash and proceeding as above. This must be done when the mill is not in operation, and immediately after it is shut down.

Fiber in Clean Cane.

Adopt one of the following methods:

A. *Sampling.* As many samples as possible should be taken from the cane from each field as delivered. In lieu of this, as many samples as possible should be taken from the carrier up to one every two hours. A sample should consist of three or four entire stalks. Subsample and reduce to a fine state of division by one of the following methods:

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1. With a sharp cane knife, cut pieces of equal length (about 6″) from the top, middle and bottom of each stalk. Slice into quarters or eighths, and keep one slice from each piece for the sample. Weigh the sample and chop fine in an Athol chopping machine. Place in a linen bag, rinsing the last portions in with water.

2. Instead of slicing the short pieces as above they may be split in halves and from two to three inches of one of the halves from each piece shaved off by drawing the ends over a Japanese plane,[1] held upside down in a vise. All of the shavings are weighed and put into the bag for washing.

3. Where a disintegrator is available, the whole sample should be passed through this machine, thoroughly mixed and about 200 grams placed in the bag. Care should be taken that no loss of juice takes place.

Determination. Wash in running water until the washings are clear, place the bag in a heavy canvas bag and press in a strong screw press. The pressed cake is then broken up and treated with cold running water for two minutes, and again pressed; the two operations being repeated alternately five times. The bag is then placed in an air bath at 125° C. for half an hour, after which the fiber is removed from the bag and dried in a shallow dish for three hours at the same temperature. When a press is not available, the sample in the bag may be washed in cold running water for 24 hours and dried as above described.

B. Average sticks of cane should be taken from the carrier at approximately regular intervals and allowed to accumulate during 24 hours. The whole sample is then weighed on a platform scale, run through a small mill, and the bagasse weighed again. This bagasse is cut into ½ inch pieces with an ordinary feed-cutter, mixed and chopped fine in an Athol chopping machine with the hopper covered. One hundred and fifty gms. of the fine sample are placed in a strong linen bag and treated as above.

This method[2] has an advantage of accuracy over the ordinary method in that it starts with a larger sample of the cane and uses the whole stick, the method of subsampling making it possible to determine the fiber in the large sample in washing only a small amount of the chopped cane:

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[1] Greenfield, Record, Vol. IX (1913), p. 616.
[2] Norris, Record, Vol. VI, 1912, p. 105.

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Example: Weight of cane..... 55.5 lbs.
" " bagasse ..... 32.0 "
" " " washed ..... 150.0 gms.
" " dry fiber ..... 28.7 "

$$\text{" " cane washed} = \frac{55.5 \times 150}{32} = 260.16 \text{ "}$$

$$\% \text{ Fiber} = \frac{28.7 \times 100}{260.16} = 11.0$$

C. (Provisional Method)[3]. The fiber may be determined indirectly from the moisture in the chopped or disintegrated cane. Every hour or two a sample of the cane on the carrier is reduced to a fine state of division by one of the above methods. About 10 grams of the fine sample are weighed in a double watch glass and dried for four hours at 110° to 120° C. in an oven. This gives the percent moisture in the cane. The Brix of a sample of first mill juice, taken at the same time as the cane sample, is determined as described below, and the Brix of the normal juice calculated from it with the factor determined as described below. From the two figures thus found the fiber in the cane is calculated by the formula:—

$$100 - \frac{100\,M}{100 - B}$$

M = Percent moisture in cane.
B = Brix of normal juice.

Polarization.

The methods for the determination of sugar in the cane are indirect and direct, but owing to the difficulty of sampling, the former method should be used for mill control.

1. Indirect Method.

$$\text{Polarization of cane} = \frac{\text{Weight polarization in mixed juice} + \text{weight polarization in bagasse}}{\text{Weight cane}}$$

or

$$\text{Polarization of cane} = \frac{\text{Polarization normal juice } (100 - \text{fiber \% cane})}{100}$$

2. Direct Method.

[3] Savage, Record, Vol. II, 1910, page 204.

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The cane is sliced, chopped in an Athol chopping machine, pounded in a large cast-iron mortar to a smooth pulp and 26.00 gms. are weighed and transferred with water and a little sodium carbonate into an extraction flask graduated to 202.60 c. c. The flask is filled with water to a few cubic centimeters under the mark and immersed into a water bath which is maintained at a temperature of 100° C. After having remained for one hour in the bath, the flask is taken out and cooled rapidly, a few cubic centimeters of basic lead acetate solution added, the flask filled with water to the mark and the contents well shaken. After filtering, the liquid is polarized in a 400 mm. tube. The readings give directly the percentage of sugar in the clean cane.

Bagasse.

Sampling. Once an hour take a sample of the bagasse immediately it leaves the last mill, for the full length of the roller and the full depth of the bagasse blanket—at least a kilogram in all. Mix thoroughly with the hands for half a minute in a deep vessel to prevent evaporation of the moisture. Discard about half of it, cover the vessel and take the rest to the laboratory. Chop the whole sample, a portion at a time, so that no piece over a quarter of an inch (6 mm.) in diameter is left.

Moisture. Weigh out an amount of bagasse equal to 50 or 100 grams of the sample before chopping, on a shallow tray three-quarters of an inch (2 cm.) or less in depth. Heat in an oven at 125° to 130° C. for three hours. Weigh quickly. Calculate the per cent. moisture from the loss in weight.

Polarization. Weigh out an amount equal to 100 grams of the original bagasse into the inner digestion cup of the digester. See figure next page. Add about 500 c. c. of hot water, containing 5 c. c. of a 5% solution of sodium carbonte. Press the bagasse down into the solution, and place the cup in the outside vessel containing boiling water. Digest for an hour, mixing the solution with the bagasse every 15 minutes by pressing down with the tamp, and using the latter for a cover for the digestion cup between times. *Do not add any more water.* Allow the mixture to cool a little and weigh. Press out as much of the solution as possible with the tamp into a flask; cool to laboratory temperature, pour 99 c. c. of the solution into a 100 c. c. flask; make up to 100 c. c. with lead subacetate solution, filter and polarize in a 400 mm. tube. Find from Table No. 15 or the formula below the polarization of the bagasse corresponding to the reading. If a 200 mm. tube is used, the reading is to be doubled.

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Formula:—

$$\frac{R\ (W - f)}{2 \times 3.8 \times 100} = \text{Polarization.}$$

R = Polariscope reading in a 400 mm. tube.
W = Weight of bagasse + solution, corresponding to 100 grams bagasse.
f = Per cent fiber in bagasse.

The latter is taken as fifty, there being very little difference in the results with the usual variations in the fiber.

Brix of Residual Juice. This should be calculated by the following formula:

$$\frac{100 \text{ Pol. Bagasse}}{(100 - f)\ \text{Pur. R. J.}}$$

Pur. R. J. = Purity of the residual juice, assumed to be the same as that of the last mill juice.
f = The same as in formula above.

Fiber. The fiber may be either determined directly as in cane or calculated by difference. When calculated, the results should be checked occasionally by direct determination.

Normal Juice.

Brix. The Brix of the normal juice is found by averaging the Brix of the juices from the different sets of rollers and from the bagasse, when no water is being used on the mills. The test is made as follows:

All water having been shut off, samples of juice and bagasse are taken from each set of rollers, and also a sample of cane for fiber. The Brix, polarization and purity of the juices, and the polarization and moisture in the bagasse samples are determined. From the polarization and moisture content of the bagasse samples and the purities of the juices, the fiber content of the bagasse samples is calculated. From the ratio of fiber per cent. cane to fiber per cent. bagasse, the juice extraction per cent. cane for each set of rollers is calculated, and from the latter and the Brix of the juices, including the residual juice of the final bagasse, the Brix of the normal juice is calculated. For example:

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Available data:

Juice Analyses.

	Brix.	Polarization.	Purity.
Crusher + Mill I	21.3	19.3	90.6
Mill II	20.9	18.1	86.5
" III	21.1	18.1	85.7
" IV	20.7	17.3	83.5

Bagasse Analyses.

	% Sugar.	% Moisture.
Crusher + Mill I	10.1	54.1
Mill II	9.2	49.9
" III	8.3	46.0
" IV	8.0	44.0

Fiber in Cane, 11.3%.

Fiber % Bagasse.

$$\text{Crusher + Mill I} = 100 - \frac{10.1}{0.865} - 54.1 = 34.2$$

$$\text{" II} = 100 - \frac{9.2}{0.857} - 49.9 = 39.4$$

$$\text{" III} = 100 - \frac{8.3}{0.835} - 46.0 = 44.1$$

$$\text{" IV} = 100 - \frac{8.0}{0.835} - 44.0 = 46.4$$

Juice Extracted % Cane.

$$\text{Crusher + Mill I} = 100 - \frac{11.3}{0.342} = 67.0$$

$$\text{" II} = 100 - \frac{11.3}{0.394} - 67.0 = 4.3$$

$$\text{" III} = 100 - \frac{11.3}{0.441} - (67.0 + 4.3) = 3.1$$

$$\text{" IV} = 100 - \frac{11.3}{0.464} - (67.0 + 4.3 + 3.1) = 1.2$$

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Total Juice Extracted % Cane = 75.6.
Final Bagasse % Cane 100 — 75.6 = 24.4.
Juice in Final Bagasse % Cane = 24.4 — 11.3 = 13.1.

$$\text{Brix of Residual Juice of Final Bagasse} = \frac{8.0 \times 100}{(100 - 46.4) \times 0.835} = 17.9$$

Brix of Normal Juice

$$\frac{67.0 \times 21.3 + 4.3 \times 20.9 + 3.1 \times 21.1 + 1.2 \times 20.7 + 13.1 \times 17.9}{100 - 11.3}$$

$= 20.7$

Ratio of Brix of Normal Juice to Brix of First Expressed Juice

$$= \frac{20.7}{21.3} = 0.972$$

The determination of the juice extraction[4] can be simplified by finding the fiber content of the cane and of the bagasse from each mill separately. In this case 100 grams of the crusher bagasse are taken for a sample for washing, 80 grams of the first mill bagasse, 70 grams of the second mill bagasse, 60 grams of the third mill bagasse, and 50 grams of the bagasse from the fourth, and subsequent mills. The samples must be chopped to a fine state of division. No juice samples are necessary, unless it is desired to determine the factor for calculating the Brix of the normal juice; in which case the Brix of each mill juice must be found, as well as the purity of the last mill juice, and the sugar in the last mill bagasse.

Mill Juices.

Of all the different juices in the mill the mixed juice is the starting point of the control and in sampling as well in analysis should have special careful attention.

Sampling. When possible the samples of juices should be taken continuously, in proportion to the output, and run into clean containers to which has been added about one part of formalin to 1000 parts of juice. Each sample analyzed should represent a known amount (weight or volume) of material, preferable always a like amount for the same grade in order to facilitate averaging the results.

For collecting juice samples only buckets should be used; bottles, demijohns or jugs do not permit of a thorough cleaning with the hands and are therefore objectionable.

[4] Norris, Record, Vol. XI, 1914, p. 1.

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Mixed Juice:

1. "Wire Sampler," Davoll, Record, Vol. VIII, page 360; Jour. Indus. and Eng. Chem., Vol. V, 1913, page 313.
2. Horsen-Deon Sampler, Spencer, Handbook, 1909, page 108.
3. Duncan, Electro Magnetic Juice Sampler, Record, Vol. XI, page 56.
4. Calumet Automatic Sampler, Record, Vol. III, page 78.
5. Coomb's Drip-sampler, Spencer, Handbook, 1909, page 107.
6. Westcoatt Spoon Sampler. Savage, Record, Vol. VIII, page 155.

Any of these or other similar sampling devices may be used, *if they are kept clean.*

The simplest and most generally used form of continuous sampler is the "Wire Sampler" referred to above. It is easily kept clean, and if the wire is not longer than 4 inches, loss by evaporation need not be feared.

The general objection to this method of sampling is that the sample—while continuous—is not always in proportion to the amount of juice passing through the main juice pipe—this difficulty may, however, to a great extent be obviated by changing the sample bucket when one or a definite number of mixed juice liming tanks or measuring tanks are filled, and make up the composite sample for analysis from equal volumes, of subsamples taken as indicated.

The mixed juice should be analyzed every two or three hours.

First Mill Juice. 1. A very simple and effective continuous sampler[5] for this juice is a piece of wire, one end resting against the feed roller and the other on the cover of or inside of the sample bucket.

2. Place a pail beneath the feed roller of the first unit. This pail holds about 8 liters and has a cover slightly inclined; holes are made near its apex, from the inside outward, sufficient in number to about half fill the pail in two hours.[6]

Last Mill Juice should be taken at the same time as the bagasse sample, and analyzed at least once every two hours.

Press Juice, Clarified Juice and Syrup can be sampled in the same manner as mixed juice; the sample should be brought into the laboratory every two hours, composited and analyzed every four or six hours.

[5] Norris, Record, Vol. VII, p. 299.
[6] Davoll, Record, Vol. VIII, p. 362.

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Density. The juice sample is poured over a wire gauze funnel into a glass cylinder to overflowing.

It is freed from air, particles of trash removed, sand and dirt allowed to settle and brought to the temperature of the laboratory. A Brix spindle graduated at 27½° C., and perfectly dry, is carefully lowered into the juice. Care should be taken that there is no vibration, that the instrument floats freely and that it does not touch the wall of the cylinder. The surface of the liquid should be level with the top of the cylinder. After the spindle has reached the temperature of the juice note the graduation on a level with the surface of the juice, also the temperature.

The reading gives the apparent solids in the juice expressed in degrees Brix.

Total Solids. The total solids are determined by drying.

About 15 grams of clean, dry silica sand are placed in a small flat aluminum dish with a cover, heated in an air at 150° C. for half an hour, cooled in a desiccator and weighed. About 5 grams of juice are poured evenly into the dish, which is weighed again. It is then heated, preferably in a vacuum oven at 75°, or in an air bath at 100 to 105° C. for 5 hours, cooled in a dessicator and weighed. The difference in weight before and after drying deducted from the weight of the juice gives the total solids.

Example:

Dish and Sand and Juice	35.035 grams
Dish and Sand	32.012 grams
Weight of Juice	3.023 grams
Dish and Sand and Juice after drying	32.542 grams
Total solids = 3.023 — (35.035 — 32.542) =	0.530 grams

$$\text{Total solids} = \frac{0.530 \times 100}{3.023} = 17.3\%$$

Polarization.

1. Using Normal Weight.

After the juice has settled in the glass cylinder and the Brix has been taken, weigh out three times the normal weight, pour into a 100 c. c. flask, wash all the juice from the dish into the flask with distilled water, add sufficient subacetate of lead solution, fill with water up to the 100 c. c. mark, filter and polarize in a 200 mm. tube.

The reading divided by 3 gives the polarization of the juice.

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2. Using Spencer's Pipette.

Fill pipette which has been calibrated with juice to the mark corresponding with the observed uncorrected Brix and discharge it into a 100 c. c. flask. Add 3 to 5 c. c. of lead subacetate solution, complete the volume to 100 c. c. with water; mix thoroughly and filter, polarize the filtrate in a 200 mm. tube and divide the polariscope reading by 2 to obtain the polarization.

3. Using a 100/100 c. c. Flask.

Fill a 100/110 c. c. flask with the juice to the lower mark, add about 5 c. c. of lead subacetate solution, fill with water to the upper mark, shake, filter and polarize. The polarization of the juice is found from the polariscope reading and the uncorrected Brix by consulting Table No. 14.

Using Horne's Dry Subacetate of Lead.

This method is to be recommended as it avoids all errors of weighing or measuring.

To any quantity of juice in any convenient container, preferably 100 c. c. in a 250 c. c. Erlenmayer flask, dry lead subacetate (about 2 grams to 100 c. c. juice) is added, shaken, filtered and polarized. For finding the percentage of sugar use Table No. 4.

Sucrose. Use one of the following methods:

A. In presence of other optically active substances the polarization does not give the true sucrose content, and it is necessary to use the inversion or double polarization method.

For the determination of the per cent. sucrose in juices the solution for the direct polarization and that used for inversion should be taken from the same clarified filtrate.

Place 75 c. c. of the filtrate of the original juice clarified with subacetate of lead in a 100 c. c. flask, add 5 c. c. conc. hydrochloric acid, introduce a thermometer and place the flask in a water bath heated to 72° C. As soon as the thermometer in the flask indicates 69° C. (3 to 5 min.), keep the solution at this temperature exactly 5 minutes, rotating the flask gently at intervals to secure an even distribution of the heat. Remove from the bath, cool rapidly to the same temperature at which the direct polarization had been made and make up to 100 c. c. with water,

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filter and read the solution in a waterjacketed 200 mm. tube, noting the temperature. Calculate the per cent. sucrose from the formula[7] $S = \frac{100\ (D - \frac{4}{3}\ I)}{142.4 - 0.5\ t}$ in which

D = Direct reading.
I = Invert reading.
t = Observed temperature of solution.

Example: The direct polarization of juice of 15 Brix clarified by Horne's dry subacetate of lead is 50.1.

75 c. c. of the filtrate inverted as above gives at 26.2° C. a reading of minus 11.9 then $\frac{100\ (\ 50.1 + \frac{4}{3} \times 11.9\ )}{142.\ 4 - 13.1} = 51.0$ and according to table

% polarization of juice = 12.33
% sucrose in juice = 12.55

B. (Provisional)[8]. A 100/110 c. c. flask is filled with the juice to the 100 c. c. mark, clarified with 5 c. c. of a 30% solution of neutral lead acetate, completed with water to the 110 mark, shaken, filtered and polarized.

50 c. c. of the filtrate are pipetted into a 100 c. c. flask after which 30 c. c. of hydrochloric acid of 1.10 spec. gravity is added. (Dilute ordinary conc. hydrochloric acid with its volume of water.) The contents of the flask are mixed by shaking, and the flask is put aside for 3 hours at 20°-25° C. or 2 hours at 25°-30° C.

The flask is then filled up with water to the mark, filtered and polarized in a waterjacketed 200 mm. tube. Immediately after polarization the temperature of the liquid in the tube is ascertained and noted.

For calculating the real sucrose content the following formula is used:

Sucrose $\frac{100\ (\ D - 2\ I)}{C - 0.5\ t}$ in which D is the direct polarization, I is polarization after inversion, t is the observed tem-

[7] We recognize that the factor used in this and subsequent formulae is probably not correct, but as it has not been definitely decided what the correct factor is, we prefer to make no change.

[8] Steuerwald, Record, Vol. X, 1914, p. 350; Java Archief, Vol. XXI, 1913, p. 831.

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perature and C a constant for the different concentrations and temperature.

Table of Constants.

Reading After Inversion.	Temperature of the Polariscope.						
	32° C.	30° C.	28° C.	26° C.	24° C.	22° C.	20° C.
−18	...	...	...	...	...	145.51	145.54
−17	...	...	...	145.39	145.42	145.46	145.49
−16	...	145.27	145.30	145.34	145.37	145.41	145.44
−15	145.18	.22	.25	.28	.32	.35	.39
−14	.12	.16	.19	.23	.26	.30	.34
−13	.06	.10	.13	.17	.21	.25	.29
−12	.00	.04	.08	.12	.16	.20	.24
−11	144.94	144.98	.02	.07	.11	.15	.19
−10	.88	.93	144.97	.01	.06	.10	.14
− 9	.82	.87	.91	144.96	.00	.05	.10
− 8	.77	.81	.86	.90	144.95	.00	.05
− 7	.71	.75	.79	.84	.90	144.95	.00
− 6	.65	.70	.74	.79	.84	.89	144.95
− 5	.59	.64	.69	.74	.79	.84	.90
− 4	.53	.58	.63	.68	.74	.79	.85
− 3	.47	.52	.58	.63	.69	.74	.80
− 2	.41	.46	.52	.58	.63	.69	.75
− 1	.35	.41	.46	.52	.58	.64	.70

Example: Polarization before inversion, D..... 48.25
do after do I.....— 8.25
Temperature of the Polariscope..... 30.0 °C.
Constant to be applied..... 144.82
Temperature of the inverted liquid..... 29.7
Polarization caused by sucrose only =

$$\frac{100\,(48.25 + 2 \times 8.25)}{144.82 - 14.85} = 49.8$$

The per cent. sucrose is then found in Schmitz' table, which at 14.8 Brix of the original juice would be 13.43%.

Glucose. To a double normal weight of juice in a 100 c. c. flask add about 3 c. c. neutral lead acetate solution, make up to the mark and filter. To 75 c. c. of the filtrate in a 100 c. c. flask add a 5% solution of sodium carbonate slowly until a precipitate is no longer formed, to remove the lead from the solution. Make up to the mark and filter. Transfer the filtrate to a burette.

Place 5 c. c. of a mixed Soxhlet's copper solution in a 150 c. c. casserole, add 25 c. c. distilled water, and heat to boiling. To determine approximately the amount required for complete reduction of the copper, add the juice from the burette in successive portions of 5 to 10 c. c., boiling the solution for one minute,

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until the blue color disappears. When this point is reached take a fresh portion of 10 c. c. of copper solution, add 50 c. c. water and heat to boiling. Now add nearly the total amount of juice required, as previously determined, and boil for two minutes. Continue to add the juice, about one c. c. at a time, heating to boiling after each addition. When the blue color has disappeared the solution is tested for copper, by dipping in the point of a small folded filter of hardened paper (S. and S. No. 575, cut to 1″ diam.) held by means of forceps, and removing a drop or two with a small pipette with rubber bulb. Test the drop on a poreclain plate with a small amount of a mixture of 10% acetic acid and a 2% solution of potassium ferrocyanide. Make the testing solution fresh for each test and mix on plate. A brown color indicates copper. Proceed with the addition of the juice until a drop gives no color, showing that all the copper has been reduced.

The amount of glucose in the juice is found by the formula:

$$G = \frac{12.82}{V}$$

in which G = % glucose in the juice, and V = cubic centimeters of juice required for reducing 10 c. c. copper solution.

Example: Burette reading, before..... 2.6
" " after 28.2

Cubic centimeters of juice required..... 25.6

$$\frac{12.82}{25.6} = 0.5\% \text{ glucose}$$

Suspended Solids in Mixed Juice.

Weigh between 20 and 50 gms. of a representative sample of juice, dilute with about 200 c. c. of distilled water and allow to settle. Syphon off as much of the settled juice as possible, dilute again, settle and filter over a tared Gooch filter, washing the precipitate thoroughly into the filter, wash with water and dry at 100° C.; weigh and calculate the results on the original weight of juice.

Example: 30 gms. juice weighed, diluted, settled, filtered over a Gooch filter and dried—
Weight of Gooch filter plus dried residue... 20.2085 grams
" " " " dry . . .. 20.1530 grams

" " residue . . .. 0.0555 grams

$$\frac{0.0555 \times 100}{30} = 0.18\%.$$

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Press Cake.

Sampling. A definite number of small portions of filter press cake should be removed from different parts of the cake, and from different parts of each press as it is emptied.

For sampling use a piece of evaporator tubing about six inches long, filed sharp on one end, with a wooden plug to drive the sample out. For taking samples from cars the tubes should be from three to four feet long, cut off diagonally on one end and sharpened. Place the samples in a covered box and take to the laboratory every two hours, noting the number of presses emptied. A piece of absorbant cottom moistened with formaldehyde should be placed in the sample box. Mix the press cake samples thoroughly; for mixing and breaking up the samples a wire potato masher may be used.

Polarization. To determine the polarization, the sample is broken up into fine pieces, 25 gms. weighed out, beaten to a thin paste with cold water, transferred to a 100 c. c. flask, about 3 c. c. of subacetate of lead solution added, and polarized. Or a normal weight of the cake may be used and the solution made up to 104 c. c.

Moisture. Weigh out accurately 25 to 30 grams of the mixed sample in a shallow disk and dry in an oven from 3 to 5 hours at 100° to 105° C. Calculate the moisture from the loss in weight.

Syrup.

Sampling. Syrup samples should be taken continuously where possible. Otherwise an aliquot portion should be taken from each tank as filled, and analyzed every six hours.

Brix and Polarization. In order that the purity of the syrup may be comparable with that of the mixed or clarified juice it must be diluted with water to about the same density before analysis. The syrup and water should be each weighed into a sample cup or jar, thoroughly mixed, the air removed and the Brix and polarization determined the same as in mixed juice. The composition of the syrup is then calculated from the results obtained.

Example:	Water	800 gms.
	Syrup	200 "
	Dilution one to five.	
	Cor. Brix, diluted syrup	13.9
	Polarization, diluted syrup	12.2
	Calculated Brix (13.9 × 5)	69.5
	" Polarization	61.0
	Apparent Purity	87.8

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Sucrose. From each sample of syrup collected during the day a small subsample is put aside for the determination of sucrose once in 24 hours.

It is best to take the direct as well as the invert reading on this sample.

A normal weight of the syrup is transferred to a 100 c. c. flask with the aid of a little water, from 3 to 5 c. c. lead subacetate solution added, filled to the mark with water, shaken, filtered and polarized in a 200 mm. tube, noting the temperature of the solution. The reading gives the direct polarization.

Place 50 c. c. of the filtrate in a 100 c. c. flask, add about 25 c. c. of water and proceed as described under sucrose in mill juices, above.

Make up to 100 c. c. and polarize in a 200 mm. water-jacketed tube, at the same temperature at which the direct reading was made. The sucrose is found from the formula:

$$\frac{100\ (D - 2\ I\ )}{142.3 - 0.5\ t}$$

in which D = direct polarization, I = invert reading, and t = temperature of observation in centigrade degrees:

Example: D = 57.8
I = −8.4
t = 27° C.

$$\frac{100\ (57.8 - (-16.8))}{142.3 - 13.5} = 57.9\%$$

Glucose. If it is desired to determine the glucose the subsample taken for the determination of sucrose should be used. Dilute the same as for the Brix determination and proceed the same as under mill juices above.

MASSECUITES.

Sampling. Take a large sample of massecuite as it is leaving the pan, from the first, middle and last part of each strike, mix well and take a subsample to laboratory, where it can either be analyzed at once or composite samples can be made up from each grade, and analyzed once a week. Massecuites can be kept without a preservative for several days in a closed container without deterioration.

Analysis. A diluted sample is prepared by the method described under Syrup, of from 15° to 20° Brix, the Brix and

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polarization determined and calculated back to the original. Great care must be taken that all the grain is dissolved in diluting.

From the Brix and polarization the apparent purity may be found in Table No. 16.

MOLASSES.

The first and second molasses as they come from the centrifugals are seldom analysed any further than for apparent purity and Brix.

The methods followed are the same as those described for massecuites.

It may be noted here that in case the purity alone is wanted and not the Brix that an approximate mixture of 15° Brix is sufficient and that no weighing need be done.

COMMERCIAL SUGAR.

Sampling.

The sample is best taken automatically, where this can be arranged so that there will be evaporation. Otherwise, a pinch should be taken from every few bags as they are weighed and placed in a covered bucket with a small hole in the top.

Empty the content of the sample bucket upon a large sheet of heavy glass plate or other non-absorbant material (as glazed porcelain), remove foreign matter and mix rapidly. Crush lumps and thoroughly incorporate with the rest of the sugar. Weigh out for analysis at once.

Total Solids. About two grams of sugar are weighed on one of a set of double watch glasses, made to fit together tightly with a clamp, and heated in an oven at 100° to 105° C. for three hours, the watch glasses then placed together, cooled in a dessicator, and weighed. From the loss in weight the per cent. moisture is calculated, and 100 – % moisture = total solids.

Brix. Weigh out 500 grams of sugar, add 500 grams of water and stir until the sugar is completely dissolved. Remove the air under a vacuum, determine the Brix of the solution and multiply the result by two for the Brix of the sugar.

Polarization. A normal weight of sugar is dissolved in water in a 100 c. c. flask, from one to two c. c. lead solution added and made up to the mark. The filtrate is polarized in a 200 mm. tube. On account of differences in temperature, the polarizations of commercial sugar read about 0.3 higher in New York and 0.2 higher at San Francisco than in Hawaii.

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Sucrose. To 50 c. c. of the filtrate obtained as above with 25 c. c. of water in a 100 c. c. flask, 5 c. c. of conc. hydrochloric acid are added and the inversion carried out the same as for syrup. The reading is made in a 200 mm. tube. The per cent. sucrose is calculated by the following formula:

$$\% \text{ Sucrose} = \frac{100\,(D - 2I)}{142.6 - 0.5t}$$

in which the letters have the same significance as under syrup.

Example: D = 96.2
I = −13.9
t = 28.2

$$\frac{100\,(96.2 + 27.8)}{142.6 - 14.1} = 96.5$$

Final Molasses.

Sampling. Take an aliquot quantity of final molasses from each weighing or measuring tank, and keep in a closed container until the end of the week.

Brix. The average sample of final molasses must be diluted to about the average Brix of the mixed juice, and after the removal of the air, the Brix determined as described under syrup. Care must be taken that no grains of sugar are left undissolved.

Insoluble Solids. Weigh about 5 grams of the thoroughly mixed sample of molasses in a sugar dish, wash into a 500 c. c. flask, make up to the mark, and mix thoroughly. Measure out 100 c. c. of the solution with a pipette and pass through a Gooch crucible with asbestos pad which has been previously dried and weighed. Wash four or five times with distilled water, dry at 100° to 105° C. for two hours and weigh.

Total Solids. About 15 grams of medium fine silica sand that has been washed with hydrochloric acid, or half that weight of coarsely powdered pumice stone, are placed in a shallow dish with a short stirring rod and heated for an hour at 100° to 105° C. After cooling in a dessicator and weighing, about 3 grams of molasses are weighed into the dish, about one cubic centimeter of hot water added, and the liquid thoroughly mixed with the sand. It is now heated, preferably in a vacuum oven at 75° C., or in an air bath at 100-105° C. for five hours, cooled in a dessicator, and weighed. The weight found, minus the weight of the dish plus sand, equals the weight of total solids.

Polarization and Sucrose. Dissolve 35.75 grams molasses in water, add 40 c. c. basic acetate of lead solution, make up to

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250 c. c. with water and filter. To 50 c. c. of the filtrate add 1 c. c. of a saturated solution of aluminum sulfate, make up to 55 c. c., filter and polarize in a 200 mm. tube; the reading multiplied by 2 gives the direct polarization. Put 75 c. c. of the original filtrate in a 100 c. c. flask, add 5 c. c. conc. hydrochloric acid, mix, introduce a thermometer into the flask, which is then placed in a water bath heated to 72° C. When the thermometer in the flask indicates 69° C. (3 to 5 min.), the solution is kept at this temperature for exactly 5 minutes, rotating the flask gently at frequent intervals to secure even distribution of heat. Then remove from the bath and cool rapidly. Add slowly a little more zinc dust than is sufficient to precipitate the lead, or a few crystals of sodium sulfite, bring the solution to the same temperature as that on which the direct reading was made, and make up to 110 c. c. with water of the same temperature. Filter and read the solution in a water-jacketed 200 mm. tube, noting the temperature accurately, which should be within one degree of that for the direct polarization. Calculate the per cent. sucrose from the formula—

$$\% \text{ Sucrose} = \frac{100\,(\,2D - \tfrac{8}{3}\,I\,)}{142 - 0.5t}$$

in which

D = Direct reading.
I = Invert reading.
t = Observed temperature of solution.

Example: Direct reading 16.0
Invert reading ..... − 5.9, Temp. 27.6° C.

$$\% \text{ Sucrose} = \frac{100\,(32.0 + 15.7)}{142 - 13.8} = 37.2$$

Glucose. Weigh out 10 grams of the molasses and transfer with about 200 c. c. of water to a 250 c. c. flask. Add *neutral* lead acetate solution (see Reagents) until no further precipitate is formed, as can be noted by allowing a few drops to run down along the inside surface of the flask. This usually requires about 5 c. c. Make up to the mark and filter. To 125 c. c. of the filtrate in a 250 c. c. flask add neutral potassium oxalate solution (see Reagents) in small amounts until the precipitate settles quickly, leaving a clear solution. Fill to the mark with water, mix thoroughly and filter. Place 5 c. c. of the filtrate in each of five test tubes and add 4, 5, 6, 7 and 8 c. c. respectively of mixed Soxhlet's solution. Heat to boiling, allow to settle and note which is the first tube that has an excess of the copper solution as indicated by a distinct blue color in the supernatant liquid. Measure ten times the volume of mixed Soxhlet's solution that was used in this tube into a 400 c. c. beaker, add 50 c. c. of the filtered mo-

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lasses solution (equivalent to one gram of molasses) and cover with a watch glass. Heat to boiling and boil gently for exactly two minutes. Add 100 c. c. cold distilled water and filter immediately through a Gooch crucible with asbestos pad, prepared as below, using a filter pump. Transfer all of the cuprous oxide precipitate to the crucible and wash five or six times with hot water. Dry in an oven at 100° C. or over for half an hour. Heat to full redness for 15 minutes, cool in a desiccator and weigh quickly, as cupric oxide is very hygroscopic. The weight of glucose in milligrams corresponding to the weight of cupric oxide found is given in Table No. 9, column 2.

To prepare a Gooch crucible for filtering, attach to a filter pump, pour enough washed asbestos (see Reagents) suspended in water into it to make a pad ¼ inch thick, wash four or five times with distilled water, dry for half an hour in an oven, ignite to redness, cool in a desiccator and weigh.

Ash. Weigh out 3 to 5 grams of molasses into a platinum dish. Add an equal volume of concentrated sulfuric acid, and heat gently at first and finally to a dull red heat until the ash remaining is free from particles of carbon. The final heating is best done in a muffle furnace. Add a few more drops of acid and heat again to redness. Cool in a desiccator and weigh. Subtract ten per cent. from the weight of sulfated ash to get the carbonated ash.

Example:	Weight of dish and molasses.....	34.572	grams
	" " "	31.438	"
	" " molasses	3.134	"
	" " dish and ash	31.870	
	" " "	31.438	
	" " sulfated ash	0.432	
	Less 10%	0.043	
	Weight of carbonated ash.....	0.389	

$$\text{Per cent of } \text{" } \text{" } = \frac{0.389 \times 100}{3.134} = 12.4$$

Condenser Water.

From Evaporator. To test the condenser water for sugar from entrainment, three to five liters of condenser water are collected from as near the condenser of the evaporator as possible, a liter at a time, at intervals of half an hour, and placed in a

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perfectly clean vessel, preferably one that has not had sugar in any form in it before. The evaporation may be begun as soon as the first sample is collected. About two cubic centimeters of a five per cent. solution of sodium carbonate are added to the water at the beginning of the evaporation. When the water has been evaporated down to about 150 c. c., the large dish is removed from the stove, and the water is transferred to a small evaporating dish, the last traces being carefully washed out of the large dish into the small one. A sheet of asbestos, with a two and a half inch hole in it, is placed on the stove with the small dish containing the water. The evaporation is continued until only about 75 c. c. remains. It is not safe to go beyond this, on account of the risk of decomposing some of the sugar. The solution is then transferred to a 100 c. c. sugar flask, about 1 c. c. of lead subacetate solution and a little aluminum cream added, and make up to 100 c. c. From the polariscope reading of this solution, after filtering, its polarization can be found from Table No. 4, taking the first reading on the left hand side of the table. To find the polarization of the condensed water from this, divide by fifty, since the water was evaporated to one-fiftieth of its original volumes.

For instance, suppose the polariscope reading were 3.0, the 100 c. c. of evaporated solution would then have a polarization of 0.78, and the original condenser water a polarization of 0.016.

The weight of sugar lost per day may be found from the above figure and the weight of condenser water as calculated on pages 30-32.

The determination of the polarization of the condensed vapor of the different vessels is carried out in the same way; the amount of this water can be calculated from the tons mixed juice enternig the evaporator and the per cent evaporation in the different vessels.

From Vacuum Pans. For collecting a sample of water from a condenser of a vacuum pan, screw a short piece of 3/8" pipe (beveled off on the inner end to catch the water coming down and furnished with a valve near the outer end) into the water leg at a convenient distance from the floor or other support. Connect the pipe by a short rubber tube with a five-gallon bottle of thick glass. Open the valve at the beginning of a strike sufficiently to allow the water to drop slowly into the bottle throughout the strike.

Evaporate and polarize the water as described above.

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DRAIN WATERS.

All drain and waste waters, including that from the juice heaters, evaporator calandrias and condenser, and vacuum pan coils and condensers, should be tested once a day with alpha-naphthol solution. One to two cubic centimeters of the water are treated in a test tube with three to five drops of a freshly prepared 20% alcoholic solution of alpha-naphthol. Pour the solution carefully, to avoid mixing, onto two or three cubic centimeters of concentrated, chemically pure sulfuric acid in another test tube held in an inclined position. A dark ring between the two liquids indicates sucrose or glucose.

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CALCULATIONS.

Extraction. When the weights of cane and mixed juice are known, this is calculated by the formula:

$$\frac{\text{Sucrose \% Mixed Juice}^{9} \times \text{Wt. Mixed Juice}}{\text{Sucrose \% Cane} \times \text{Wt. Cane}}$$

When accurate weights are not available it may be calculated by the formulae—

$$\text{Bagasse \% Cane} = \frac{100\ \text{Fiber \% Cane}}{\text{Fiber \% Bagasse}}$$

$$\text{Polarization of Bagasse \% Cane} = \frac{\text{Bagasse \% Cane} \times \text{Polarization of Bagasse}}{100}$$

$$\text{Extraction \% Cane} = \text{Polarization of Cane} - \text{Polarization of Bagasse \% Cane.}$$

$$\text{Extraction \% Polarization of Cane} = \frac{\text{Extraction \% Cane} \times 100}{\text{Polarization of Cane}}$$

Juice Extraction Per Cent. Juice in Cane may be calculated by the formulae,—

$$\text{Soluble Solids \% Bagasse} = \frac{\text{Polarization of Bagasse} \times 100}{\text{Purity Residual Juice}}$$

$$\text{Juice Extraction \% Juice in Cane} = 100 - \frac{100 \times \text{Bagasse \% Cane} \times \text{Sol. Solids \% Bagasse}}{\text{Brix Normal Juice (100 — Fiber \% Cane)}}$$

Juice Extraction Per Cent. Cane may be calculated by the formula,—

$$\text{Juice Extraction \% Cane} = \text{Juice Ext. \% Juice in Cane} \times (100 - \text{Fiber \% Cane})$$

Mixed Juice Per Cent. Cane may be calculated by the formula,—

$$\frac{\text{Juice Extraction \% Juice in Cane} \times \text{Brix Normal Juice} \times (100 - \text{Fiber \% Cane})}{100 \times \text{Brix Mixed Juice}}$$

Averages for all reports and records should be true averages.

EXAMPLES:

Available Data—

First Mill Juice, Brix	18.8
Mixed Juice, Brix	14.0
Polarization	11.8

[9] Ordinarily the polarization is used instead of the % sucrose in these calculations.

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Purity	84.3
Residual Juice, Purity	71.4
Extraction % Polarization of Cane, approximately	98
Cane, Fiber	12.5
Bagasse, Polarization	1.0
Moisture	38.4

$$\text{Co-efficient} = \frac{\text{Brix Normal Juice}}{\text{Brix First Mill Juice}} \times 100 = 97.4$$

Normal Juice—

$$\text{Brix} = \frac{18.8 \times 97.4}{100} = 18.3$$

$$\text{Purity} = \frac{(98 \times 84.3) + (2 \times 71.4)}{100} = 84.0$$

$$\text{Polarization} = \frac{18.3 \times 84.0}{100} = 15.4$$

Cane—

$$\text{Polarization} = \frac{15.4 \times (100 - 12.5)}{100} = 13.5$$

Bagasse—

$$\text{Soluble Solids} = \frac{1.0 \times 100}{71.4} = 1.4$$

$$\text{Fiber} = 100 - (38.4 + 1.4) = 60.2$$

$$\%\ \text{Cane} = \frac{12.5 \times 100}{60.2} = 20.8$$

$$\text{Polarization of Bagasse \% Cane} = \frac{20.8 \times 1.0}{100} = 0.2$$

$$\text{Extraction \% Cane} = 13.5 - 0.2 = 13.3$$

$$\text{Extraction \% Polarization of Cane} = \frac{13.3 \times 100}{13.5} = 98.5$$

$$\text{Juice Extraction \% Juice in Cane} = 100 - \frac{100 \times 20.8 \times 1.4}{18.3\ (100 - 12.5)} = 98.2$$

$$\text{Juice Extraction \% Cane} = 98.2 \times 0.875 = 85.9$$

$$\text{Mixed Juice \% Cane} = \frac{98.2 \times 18.3 \times 87.5}{100 \times 14.0} = 112.0$$

COMMITTEE { R. S. Norris, Chairman; W. Duker, A. Fries, H. S. Walker, G. H. Haldén.

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TABLE NO. 1.

DEGREES BRIX AND SPECIFIC GRAVITY OF SUGAR SOLUTIONS AT 27½° C., COMPARED WITH WATER AT 27½° C.

Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.
0.0	1.00000	4.0	1.01564	8.0	1.03167	12.0	1.04813
.1	1.00039	.1	1.01603	.1	1.03208	.1	1.04855
.2	1.00078	.2	1.01643	.2	1.03248	.2	1.04897
.3	1.00117	.3	1.01683	.3	1.03289	.3	1.04939
.4	1.00155	.4	1.01722	.4	1.03330	.4	1.04981
.5	1.00194	.5	1.01762	.5	1.03370	.5	1.05023
.6	1.00233	.6	1.01802	.6	1.03411	.6	1.05065
.7	1.00272	.7	1.01841	.7	1.03452	.7	1.05106
.8	1.00311	.8	1.01881	.8	1.03493	.8	1.05148
.9	1.00350	.9	1.01921	.9	1.03534	.9	1.05190
1.0	1.00389	5.0	1.01960	9.0	1.03574	13.0	1.05232
.1	1.00428	.1	1.02000	.1	1.03615	.1	1.05274
.2	1.00466	.2	1.02040	.2	1.03656	.2	1.05317
.3	1.00505	.3	1.02080	.3	1.03697	.3	1.05359
.4	1.00544	.4	1.02120	.4	1.03738	.4	1.05401
.5	1.00583	.5	1.02160	.5	1.03779	.5	1.05443
.6	1.00622	.6	1.02200	.6	1.03820	.6	1.05485
.7	1.00661	.7	1.02240	.7	1.03861	.7	1.05528
.8	1.00700	.8	1.02280	.8	1.03902	.8	1.05570
.9	1.00739	.9	1.02320	.9	1.03943	.9	1.05612
2.0	1.00778	6.0	1.02360	10.0	1.03984	14.0	1.05654
.1	1.00817	.1	1.02400	.1	1.04025	.1	1.05697
.2	1.00856	.2	1.02440	.2	1.04067	.2	1.05739
.3	1.00895	.3	1.02480	.3	1.04108	.3	1.05782
.4	1.00934	.4	1.02521	.4	1.04149	.4	1.05824
.5	1.00974	.5	1.02561	.5	1.04191	.5	1.05867
.6	1.01013	.6	1.02601	.6	1.04232	.6	1.05909
.7	1.01052	.7	1.02641	.7	1.04273	.7	1.05952
.8	1.01091	.8	1.02682	.8	1.04314	.8	1.05994
.9	1.01130	.9	1.02722	.9	1.04356	.9	1.06037
3.0	1.01169	7.0	1.02762	11.0	1.04397	15.0	1.06080
.1	1.01209	.1	1.02802	.1	1.04439	.1	1.06122
.2	1.01248	.2	1.02843	.2	1.04480	.2	1.06165
.3	1.01288	.3	1.02884	.3	1.04522	.3	1.06208
.4	1.01327	.4	1.02924	.4	1.04564	.4	1.06251
.5	1.01366	.5	1.02964	.5	1.04605	.5	1.06294
.6	1.01406	.6	1.03005	.6	1.04647	.6	1.06336
.7	1.01445	.7	1.03045	.7	1.04688	.7	1.06379
.8	1.01485	.8	1.03086	.8	1.04730	.8	1.06422
.9	1.01524	.9	1.03126	.9	1.04772	.9	1.06465

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TABLE NO. 1—Continued.

Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.
16.0	1.06508	21.0	1.08697	26.0	1.10965	31.0	1.13316
.1	1.06551	.1	1.08741	.1	1.11012	.1	1.13364
.2	1.06594	.2	1.08786	.2	1.11058	.2	1.13412
.3	1.06637	.3	1.08831	.3	1.11104	.3	1.13460
.4	1.06680	.4	1.08876	.4	1.11151	.4	1.13508
.5	1.06723	.5	1.08920	.5	1.11197	.5	1.13556
.6	1.06767	.6	1.08965	.6	1.11244	.6	1.13604
.7	1.06810	.7	1.09010	.7	1.11290	.7	1.13652
.8	1.06853	.8	1.09055	.8	1.11336	.8	1.13700
.9	1.06896	.9	1.09099	.9	1.11382	.9	1.13749
17.0	1.06940	22.0	1.09144	27.0	1.11429	32.0	1.13797
.1	1.06983	.1	1.09189	.1	1.11476	.1	1.13845
.2	1.07026	.2	1.09234	.2	1.11522	.2	1.13893
.3	1.07070	.3	1.09279	.3	1.11569	.3	1.13942
.4	1.07113	.4	1.09324	.4	1.11616	.4	1.13990
.5	1.07157	.5	1.09369	.5	1.11662	.5	1.14039
.6	1.07200	.6	1.09414	.6	1.11709	.6	1.14087
.7	1.07243	.7	1.09459	.7	1.11756	.7	1.14135
.8	1.07287	.8	1.09504	.8	1.11802	.8	1.14184
.9	1.07330	.9	1.09550	.9	1.11849	.9	1.14232
18.0	1.07374	23.0	1.09595	28.0	1.11896	33.0	1.14281
.1	1.07418	.1	1.09640	.1	1.11942	.1	1.14329
.2	1.07461	.2	1.09685	.2	1.11989	.2	1.14378
.3	1.07505	.3	1.09731	.3	1.12036	.3	1.14427
.4	1.07549	.4	1.09776	.4	1.12083	.4	1.14476
.5	1.07593	.5	1.09821	.5	1.12130	.5	1.14524
.6	1.07636	.6	1.09867	.6	1.12177	.6	1.14573
.7	1.07680	.7	1.09912	.7	1.12224	.7	1.14622
.8	1.07724	.8	1.09957	.8	1.12271	.8	1.14671
.9	1.07768	.9	1.10003	.9	1.12318	.9	1.14719
19.0	1.07812	24.0	1.10048	29.0	1.12365	34.0	1.14768
.1	1.07856	.1	1.10094	.1	1.12413	.1	1.14817
.2	1.07900	.2	1.10140	.2	1.12460	.2	1.14866
.3	1.07944	.3	1.10185	.3	1.12507	.3	1.14916
.4	1.07988	.4	1.10231	.4	1.12555	.4	1.14965
.5	1.08032	.5	1.10277	.5	1.12602	.5	1.15014
.6	1.08076	.6	1.10322	.6	1.12649	.6	1.15063
.7	1.08120	.7	1.10368	.7	1.12697	.7	1.15112
.8	1.08164	.8	1.10414	.8	1.12744	.8	1.15161
.9	1.08208	.9	1.10459	.9	1.12791	.9	1.15210
20.0	1.08253	25.0	1.10505	30.0	1.12839	35.0	1.15259
.1	1.08297	.1	1.10551	.1	1.12887	.1	1.15309
.2	1.08341	.2	1.10597	.2	1.12934	.2	1.15358
.3	1.08386	.3	1.10643	.3	1.12982	.3	1.15408
.4	1.08430	.4	1.10689	.4	1.13030	.4	1.15457
.5	1.08475	.5	1.10735	.5	1.13077	.5	1.15506
.6	1.08519	.6	1.10781	.6	1.13125	.6	1.15556
.7	1.08563	.7	1.10827	.7	1.13173	.7	1.15605
.8	1.08608	.8	1.10873	.8	1.13221	.8	1.15655
.9	1.08652	.9	1.10919	.9	1.13268	.9	1.15704

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TABLE NO. 1—Continued.

Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.
36.0	1.15753	41.0	1.18281	46.0	1.20908	51.0	1.23629
.1	1.15803	.1	1.18333	.1	1.20961	.1	1.23684
.2	1.15853	.2	1.18384	.2	1.21015	.2	1.23740
.3	1.15903	.3	1.18436	.3	1.21069	.3	1.23795
.4	1.15952	.4	1.18488	.4	1.21122	.4	1.23851
.5	1.16002	.5	1.18540	.5	1.21176	.5	1.23906
.6	1.16052	.6	1.18592	.6	1.21230	.6	1.23962
.7	1.16102	.7	1.18643	.7	1.21283	.7	1.24017
.8	1.16152	.8	1.18695	.8	1.21337	.8	1.24073
.9	1.16201	.9	1.18747	.9	1.21391	.9	1.24128
37.0	1.16251	42.0	1.18799	47.0	1.21445	52.0	1.24184
.1	1.16301	.1	1.18851	.1	1.21499	.1	1.24239
.2	1.16351	.2	1.18903	.2	1.21553	.2	1.24295
.3	1.16402	.3	1.18955	.3	1.21607	.3	1.24351
.4	1.16452	.4	1.19007	.4	1.21661	.4	1.24407
.5	1.16502	.5	1.19059	.5	1.21715	.5	1.24463
.6	1.16552	.6	1.19112	.6	1.21769	.6	1.24519
.7	1.16602	.7	1.19164	.7	1.21823	.7	1.24575
.8	1.16652	.8	1.19216	.8	1.21877	.8	1.24631
.9	1.16703	.9	1.19268	.9	1.21931	.9	1.24687
38.0	1.16753	43.0	1.19320	48.0	1.21985	53.0	1.24743
.1	1.16803	.1	1.19373	.1	1.22039	.1	1.24799
.2	1.16854	.2	1.19425	.2	1.22094	.2	1.24855
.3	1.16904	.3	1.19478	.3	1.22148	.3	1.24911
.4	1.16955	.4	1.19530	.4	1.22203	.4	1.24968
.5	1.17005	.5	1.19583	.5	1.22257	.5	1.25024
.6	1.17056	.6	1.19635	.6	1.22311	.6	1.25080
.7	1.17107	.7	1.19688	.7	1.22366	.7	1.25136
.8	1.17157	.8	1.19740	.8	1.22420	.8	1.25193
.9	1.17208	.9	1.19793	.9	1.22475	.9	1.25249
39.0	1.17258	44.0	1.19845	49.0	1.22529	54.0	1.25305
.1	1.17309	.1	1.19898	.1	1.22584	.1	1.25362
.2	1.17360	.2	1.19951	.2	1.22639	.2	1.25419
.3	1.17411	.3	1.20004	.3	1.22694	.3	1.25475
.4	1.17462	.4	1.20057	.4	1.22748	.4	1.25532
.5	1.17513	.5	1.20110	.5	1.22803	.5	1.25588
.6	1.17564	.6	1.20163	.6	1.22858	.6	1.25645
.7	1.17615	.7	1.20216	.7	1.22913	.7	1.25702
.8	1.17666	.8	1.20269	.8	1.22968	.8	1.25758
.9	1.17717	.9	1.20322	.9	1.23022	.9	1.25815
40.0	1.17768	45.0	1.20375	50.0	1.23077	55.0	1.25872
.1	1.17819	.1	1.20428	.1	1.23132	.1	1.25929
.2	1.17870	.2	1.20481	.2	1.23187	.2	1.25986
.3	1.17922	.3	1.20535	.3	1.23242	.3	1.26043
.4	1.17973	.4	1.20588	.4	1.23298	.4	1.26100
.5	1.18024	.5	1.20641	.5	1.23353	.5	1.26157
.6	1.18076	.6	1.20695	.6	1.23408	.6	1.26214
.7	1.18127	.7	1.20748	.7	1.23463	.7	1.26271
.8	1.18178	.8	1.20801	.8	1.23518	.8	1.26328
.9	1.18230	.9	1.20854	.9	1.23573	.9	1.26385

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TABLE NO. 1—Continued.

	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.
56.0	1.26443	61.0	1.29354	66.0	1.32362	71.0	1.35467
.1	1.26500	.1	1.29413	.1	1.32424	.1	1.35530
.2	1.26557	.2	1.29473	.2	1.32485	.2	1.35593
.3	1.26615	.3	1.29532	.3	1.32546	.3	1.35657
.4	1.26672	.4	1.29592	.4	1.32608	.4	1.35720
.5	1.26730	.5	1.29651	.5	1.32669	.5	1.35783
.6	1.26787	.6	1.29710	.6	1.32730	.6	1.35846
.7	1.26845	.7	1.29770	.7	1.32791	.7	1.35910
.8	1.26902	.8	1.29829	.8	1.32853	.8	1.35973
.9	1.26960	.9	1.29889	.9	1.32914	.9	1.36036
57.0	1.27017	62.0	1.29948	67.0	1.32975	72.0	1.36099
.1	1.27075	.1	1.30008	.1	1.33037	.1	1.36162
.2	1.27133	.2	1.30067	.2	1.33099	.2	1.36226
.3	1.27191	.3	1.30127	.3	1.33161	.3	1.36290
.4	1.27249	.4	1.30187	.4	1.33222	.4	1.36354
.5	1.27306	.5	1.30247	.5	1.33284	.5	1.36417
.6	1.27364	.6	1.30307	.6	1.33346	.6	1.36481
.7	1.27422	.7	1.30366	.7	1.33407	.7	1.36545
.8	1.27480	.8	1.30426	.8	1.33469	.8	1.36608
.9	1.27538	.9	1.30486	.9	1.33531	.9	1.36672
58.0	1.27596	63.0	1.30546	68.0	1.33593	73.0	1.36736
.1	1.27654	.1	1.30606	.1	1.33655	.1	1.36800
.2	1.27712	.2	1.30666	.2	1.33717	.2	1.36864
.3	1.27770	.3	1.30726	.3	1.33779	.3	1.36928
.4	1.27829	.4	1.30786	.4	1.33841	.4	1.36992
.5	1.27887	.5	1.30847	.5	1.33903	.5	1.37056
.6	1.27945	.6	1.30907	.6	1.33965	.6	1.37120
.7	1.28003	.7	1.30967	.7	1.34027	.7	1.37184
.8	1.28061	.8	1.31027	.8	1.34089	.8	1.37248
.9	1.28120	.9	1.31087	.9	1.34151	.9	1.37312
59.0	1.28178	64.0	1.31147	69.0	1.34213	74.0	1.37376
.1	1.28237	.1	1.31208	.1	1.34276	.1	1.37440
.2	1.28295	.2	1.31269	.2	1.34338	.2	1.37504
.3	1.28354	.3	1.31329	.3	1.34401	.3	1.37568
.4	1.28412	.4	1.31390	.4	1.34463	.4	1.37633
.5	1.28471	.5	1.31450	.5	1.34526	.5	1.37698
.6	1.28530	.6	1.31511	.6	1.34588	.6	1.37762
.7	1.28588	.7	1.31571	.7	1.34651	.7	1.37826
.8	1.28647	.8	1.31632	.8	1.34713	.8	1.37890
.9	1.28705	.9	1.31692	.9	1.34776	.9	1.37955
60.0	1.28764	65.0	1.31753	70.0	1.34838	75.0	1.38020
.1	1.28823	.1	1.31814	.1	1.34901	.1	1.38084
.2	1.28882	.2	1.31875	.2	1.34964	.2	1.38149
.3	1.28941	.3	1.31936	.3	1.35027	.3	1.38214
.4	1.29000	.4	1.31997	.4	1.35090	.4	1.38279
.5	1.29059	.5	1.32058	.5	1.35153	.5	1.38344
.6	1.29118	.6	1.32119	.6	1.35216	.6	1.38408
.7	1.29177	.7	1.32179	.7	1.35278	.7	1.38473
.8	1.29236	.8	1.32240	.8	1.35341	.8	1.38538
.9	1.29295	.9	1.32301	.9	1.35404	.9	1.38603

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TABLE NO. 1—Continued.

Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.
76.0	1.38668	81.0	1.41962	86.0	1.45351	91.0	1.48831
.1	1.38733	.1	1.42029	.1	1.45420	.1	1.48902
.2	1.38798	.2	1.42096	.2	1.45489	.2	1.48973
.3	1.38863	.3	1.42164	.3	1.45558	.3	1.49043
.4	1.38928	.4	1.42231	.4	1.45627	.4	1.49114
.5	1.38993	.5	1.42298	.5	1.45695	.5	1.49185
.6	1.39058	.6	1.42365	.6	1.45764	.6	1.49255
.7	1.39123	.7	1.42432	.7	1.45833	.7	1.49326
.8	1.39188	.8	1.42499	.8	1.45902	.8	1.49397
.9	1.39254	.9	1.42566	.9	1.45971	.9	1.49467
77.0	1.39319	82.0	1.42633	87.0	1.46040	92.0	1.49538
.1	1.39384	.1	1.42700	.1	1.46109	.1	1.49609
.2	1.39450	.2	1.42768	.2	1.46178	.2	1.49680
.3	1.39515	.3	1.42835	.3	1.46248	.3	1.49751
.4	1.39581	.4	1.42902	.4	1.46317	.4	1.49822
.5	1.39646	.5	1.42970	.5	1.46386	.5	1.49893
.6	1.39712	.6	1.43037	.6	1.46455	.6	1.49964
.7	1.39778	.7	1.43104	.7	1.46524	.7	1.50035
.8	1.39843	.8	1.43172	.8	1.46594	.8	1.50107
.9	1.39909	.9	1.43239	.9	1.46663	.9	1.50178
78.0	1.39974	83.0	1.43307	88.0	1.46732	93.0	1.50249
.1	1.40040	.1	1.43374	.1	1.46802	.1	1.50320
.2	1.40106	.2	1.43442	.2	1.46872	.2	1.50391
.3	1.40172	.3	1.43510	.3	1.46941	.3	1.50463
.4	1.40238	.4	1.43578	.4	1.47011	.4	1.50534
.5	1.40304	.5	1.43646	.5	1.47080	.5	1.50606
.6	1.40370	.6	1.43713	.6	1.47150	.6	1.50677
.7	1.40435	.7	1.43781	.7	1.47220	.7	1.50748
.8	1.40501	.8	1.43849	.8	1.47289	.8	1.50820
.9	1.40567	.9	1.43917	.9	1.47359	.9	1.50891
79.0	1.40633	84.0	1.43985	89.0	1.47428	94.0	1.50962
.1	1.40699	.1	1.44053	.1	1.47498	.1	1.51034
.2	1.40766	.2	1.44121	.2	1.47568	.2	1.51106
.3	1.40832	.3	1.44189	.3	1.47638	.3	1.51178
.4	1.40898	.4	1.44257	.4	1.47708	.4	1.51249
.5	1.40964	.5	1.44325	.5	1.47778	.5	1.51321
.6	1.41031	.6	1.44393	.6	1.47848	.6	1.51393
.7	1.41097	.7	1.44462	.7	1.47918	.7	1.51465
.8	1.41163	.8	1.44530	.8	1.47988	.8	1.51536
.9	1.41230	.9	1.44598	.9	1.48058	.9	1.51608
80.0	1.41296	85.0	1.44666	90.0	1.48128	95.0	1.51680
.1	1.41362	.1	1.44734	.1	1.48198	.1	1.51752
.2	1.41429	.2	1.44803	.2	1.48269	.2	1.51824
.3	1.41496	.3	1.44872	.3	1.48339	.3	1.51896
.4	1.41562	.4	1.44940	.4	1.48409	.4	1.51968
.5	1.41629	.5	1.45008	.5	1.48480	.5	1.52040
.6	1.41696	.6	1.45077	.6	1.48550	.6	1.52112
.7	1.41762	.7	1.45146	.7	1.48620	.7	1.52184
.8	1.41829	.8	1.45214	.8	1.48691	.8	1.52256
.9	1.41896	.9	1.45282	.9	1.48761	.9	1.52329

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TABLE NO. 1—Concluded.

Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.	Brix.	Specific Gravity.
96.0	1.52401	97.0	1.53125	98.0	1.53853	99.0	1.54584
.1	1.52473	.1	1.53198	.1	1.53926	.1	1.54658
.2	1.52546	.2	1.53271	.2	1.53999	.2	1.54731
.3	1.52618	.3	1.53344	.3	1.54072	.3	1.54804
.4	1.52690	.4	1.53416	.4	1.54146	.4	1.54878
.5	1.52763	.5	1.53489	.5	1.54219	.5	1.54952
.6	1.52835	.6	1.53562	.6	1.54292	.6	1.55025
.7	1.52908	.7	1.53635	.7	1.54365	.7	1.55098
.8	1.52980	.8	1.53708	.8	1.54438	.8	1.55172
.9	1.53053	.9	1.53780	.9	1.54511	.9	1.55245
						100.0	1.55319

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TABLE NO. 2.

TEMPERATURE CORRECTIONS FOR BRIX READINGS.

STANDARD 27½° C.

Temp. °C.	Observed Degrees Brix													
	0	5	10	15	20	25	30	35	40	45	50	55	60	70
	Subtract from the Readings													
0	0.73	0.93	1.11	1.25	1.39	1.51	1.62	1.72	1.82	1.89	1.96	2.01	2.04	2.09
5	0.79	0.91	1.02	1.13	1.23	1.32	1.40	1.47	1.55	1.59	1.64	1.68	1.70	1.74
10	0.75	0.82	0.89	0.96	1.02	1.08	1.14	1.20	1.24	1.28	1.31	1.33	1.35	1.37
11	0.74	0.79	0.86	0.92	0.98	1.03	1.09	1.14	1.18	1.21	1.24	1.26	1.28	1.30
12	0.72	0.76	0.82	0.88	0.93	0.98	1.04	1.08	1.12	1.14	1.17	1.19	1.20	1.22
13	0.69	0.73	0.78	0.84	0.88	0.93	0.98	1.02	1.06	1.07	1.10	1.12	1.13	1.15
14	0.66	0.70	0.74	0.79	0.83	0.88	0.92	0.96	0.99	1.00	1.03	1.05	1.06	1.07
15	0.63	0.66	0.70	0.74	0.78	0.82	0.86	0.89	0.92	0.93	0.95	0.97	0.98	0.99
16	0.60	0.62	0.66	0.69	0.73	0.76	0.80	0.83	0.86	0.86	0.88	0.90	0.91	0.92
17	0.56	0.58	0.61	0.64	0.68	0.70	0.74	0.77	0.79	0.79	0.81	0.83	0.83	0.84
18	0.52	0.54	0.56	0.59	0.62	0.64	0.68	6.70	0.72	0.72	0.74	0.75	0.75	0.76
19	0.48	0.49	0.51	0.54	0.56	0.58	0.61	0.63	0.65	0.65	0.67	0.68	0.68	0.68
20	0.43	0.44	0.46	0.48	0.50	0.52	0.54	0.56	0.58	0.58	0.59	0.60	0.60	0.60
21	0.38	0.39	0.41	0.42	0.44	0.46	0.47	0.49	0.51	0.51	0.51	0.52	0.52	0.52
22	0.33	0.34	0.35	0.36	0.38	0.40	0.40	0.42	0.43	0.43	0.43	0.44	0.44	0.44
23	0.28	0.28	0.29	0.30	0.32	0.33	0.33	0.35	0.36	0.36	0.36	0.36	0.36	0.36
24	0.22	0.22	0.23	0.24	0.25	0.26	0.26	0.27	0.28	0.28	0.28	0.28	0.28	0.28
25	0.16	0.16	0.17	0.18	0.18	0.19	0.19	0.20	0.20	0.20	0.20	0.20	0.20	0.20
26	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
27	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Add to the Readings													
28	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
29	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
30	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.20	0.20	0.20	0.20	0.20	0.20	0.20
31	0.25	0.25	0.25	0.26	0.26	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28	0.29
32	0.32	0.33	0.33	0.34	0.34	0.35	0.35	0.36	0.36	.036	0.36	0.36	0.36	0.37
33	0.40	0.41	0.41	0.42	0.42	0.43	0.43	0.44	0.44	0.44	0.44	0.44	0.44	0.45
34	0.48	0.49	0.49	0.50	0.50	0.51	0.52	0.52	0.52	0.53	0.53	0.53	0.53	0.53
35	0.56	0.57	0.57	0.58	0.59	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.62	0.62
36	0.64	0.65	0.65	0.67	0.68	0.69	0.70	0.70	0.70	0.71	0.70	0.70	0.70	0.70
37	0.72	0.74	0.74	0.76	0.77	0.78	0.79	0.79	0.79	0.80	0.79	0.79	0.79	0.79
38	0.81	0.83	0.83	0.85	0.86	0.87	0.88	0.88	0.88	0.89	0.88	0.88	0.88	0.88
39	0.90	0.92	0.92	0.94	0.95	0.96	0.97	0.97	0.97	0.98	0.97	0.97	0.97	0.97
40	0.99	1.01	1.01	1.03	1.04	1.05	1.06	1.06	1.06	1.07	1.06	1.05	1.05	1.05
45	1.48	1.50	1.50	1.52	1.53	1.53	1.53	1.53	1.52	1.52	1.51	1.50	1.50	1.48
50	2.03	2.04	2.04	2.05	2.06	2.05	2.04	2.03	2.01	2.00	1.99	1.97	1.96	1.92
55	2.62	2.63	2.63	2.64	2.62	2.60	2.58	2.55	2.52	2.50	2.48	2.45	2.43	2.37
60	3.26	3.28	3.27	3.25	3.22	3.18	3.13	3.09	3.04	3.02	2.98	2.94	2.90	2.83
65	3.95	3.98	3.95	3.90	3.86	3.79	3.71	3.66	3.58	3.56	3.50	3.44	3.38	3.30
70	4.70	4.74	4.70	4.60	4.54	4.44	4.32	4.24	4.14	4.12	4.03	3.96	3.87	3.78
75	5.50	5.56	5.48	5.34	5.26	5.12	4.95	4.86	4.72	4.70	4.57	4.50	4.37	4.27
80	6.35	6.41	6.32	6.12	6.02	5.84	5.62	5.51	5.32	5.30	5.14	5.04	4.88	4.77
85	7.26	7.33	7.21	6.94	6.82	5.59	6.31	6.18	5.94	5.92	5.72	5.61	5.40	5.28
90	8.21	8.29	8.14	7.81	7.66	7.37	7.03	6.87	6.58	6.56	6.31	6.18	5.93	5.80
95	9.22	9.31	9.12	8.72	8.54	8.19	7.78	7.59	7.24	7.22	6.92	6.77	6.47	6.33
100	10.29	10.39	10.15	9.68	9.46	9.04	8.56	8.34	7.92	7.90	7.55	7.38	7.02	6.87

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TABLE NO. 3.

WEIGHT PER CUBIC FOOT AND PER U. S. GALLON (231 CU. IN.) OF SUGAR SOLUTIONS AT 27½° C.

Degree Brix	Weight 1 cu. ft.	Weight of 1 U. S. Gal.	Degree Brix	Weight 1 cu. ft.	Weight of 1 U. S. Gal.
0	62.138	8.307	23	68.100	9.104
0.5	62.259	8.323	23.5	68.241	9.122
1.0	62.380	8.339	24	68.382	9.141
1.5	62.500	8.355	24.5	68.524	9.160
2	62.621	8.371	25	68.666	9.179
2.5	62.743	8.388	25.5	68.809	9.198
3	62.864	8.404	26	68.952	9.218
3.5	62.987	8.420	26.5	69.095	9.238
4	63.110	8.437	27	69.239	9.256
4.5	63.233	8.453	27.5	69.384	9.275
5	63.356	8.470	28	69.530	9.295
5.5	63.480	8.486	28.5	69.675	9.314
6	63.604	8.503	29	69.821	9.334
6.5	63.729	8.519	29.5	69.968	9.353
7	63.854	8.536	30	70.116	9.373
7.5	63.980	8.553	30.5	70.264	9.393
8	64.106	8.570	31	70.412	9.413
8.5	64.232	8.587	31.5	70.561	9.433
9	64.359	8.604	32	70.711	9.453
9.5	64.486	8.621	32.5	70.862	9.473
10	64.614	8.638	33	71.012	9.493
10.5	64.742	8.655	33.5	71.163	9.513
11	64.870	8.672	34	71.315	9.533
11.5	64.999	8.689	34.5	71.467	9.554
12	65.129	8.706	35	71.620	9.574
12.5	65.259	8.724	35.5	71.773	9.595
13	65.389	8.741	36	71.927	9.615
13.5	65.520	8.759	36.5	72.081	9.636
14	65.651	8.776	37	72.236	9.657
14.5	65.783	8.794	37.5	72.392	9.677
15	65.916	8.812	38	72.548	9.698
15.5	66.049	8.830	38.5	72.705	9.719
16	66.182	8.847	39	72.862	9.740
16.5	66.316	8.865	39.5	73.020	9.761
17	66.450	8.883	40	73.179	9.783
17.5	66.585	8.901	40.5	73.338	9.804
18	66.720	8.919	41	73.497	9.825
18.5	66.856	8.937	41.5	73.658	9.847
19	66.992	8.956	42	73.819	9.868
19.5	67.129	8.974	42.5	73.981	9.890
20	67.266	8.992	43	74.143	9.912
20.5	67.404	9.011	43.5	74.306	9.933
21	67.542	9.029	44	74.469	9.955
21.5	67.681	9.048	44.5	74.634	9.977
22	67.820	9.066	45	74.799	9.999
22.5	67.960	9.085	45.5	74.964	10.021

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TABLE NO. 3—Concluded.

Degree Brix	Weight 1 cu. ft.	Weight of 1 U. S. Gal.	Degree Brix	Weight 1 cu. ft.	Weight of 1 U. S. Gal.
46	75.130	10.043	73.5	85.164	11.385
46.5	75.296	10.066	74	85.363	11.411
47	75.463	10.088	74.5	85.563	11.438
47.5	75.631	10.110	75	85.763	11.465
48	75.799	10.133	75.5	85.964	11.492
48.5	75.968	10.156	76	86.165	11.519
49	76.137	10.178	76.5	86.367	11.546
49.5	76.307	10.201	77	86.570	11.573
50	76.478	10.224	77.5	86.773	11.600
50.5	76.649	10.247	78	86.977	11.627
51	76.821	10.269	78.5	87.182	11.655
51.5	76.993	10.292	79	87.387	11.682
52	77.165	10.316	79.5	87.592	11.709
52.5	77.338	10.339	80	87.798	11.737
53	77.512	10.362	80.5	88.005	11.765
53.5	77.687	10.385	81	88.212	11.792
54	77.862	10.409	81.5	88.420	11.820
54.5	78.038	10.432	82	88.629	11.848
55	78.214	10.456	82.5	88.839	11.876
55.5	78.391	10.479	83	89.049	11.904
56	78.569	10.503	83.5	89.259	11.932
56.5	78.747	10.527	84	89.469	11.960
57	78.926	10.551	84.5	89.680	11.989
75.5	79.105	10.575	85	89.892	12.017
58	79.285	10.599	85.5	90.105	12.045
58.5	79.466	10.623	86	90.318	12.074
59	79.647	10.647	86.5	90.532	12.102
59.5	79.829	10.672	87	90.746	12.131
60	80.011	10.696	87.5	90.961	12.160
60.5	80.194	10.721	88	91.176	12.189
61	80.378	10.745	88.5	91.392	12.217
61.5	80.563	10.770	89	91.609	12.246
62	80.748	10.794	89.5	91.826	12.275
62.5	80.933	10.819	90	92.044	12.305
63	81.119	10.844	90.5	92.262	12.334
63.5	81.306	10.869	91	92.481	12.363
64	81.493	10.894	91.5	92.700	12.392
64.5	81.680	10.919	92	92.920	12.422
65	81.869	10.944	92.5	93.141	12.451
65.5	82.058	10.970	93	93.362	12.481
66	82.247	10.995	93.5	93.584	12.511
66.5	82.437	11.020	94	93.806	12.540
67	82.628	11.046	94.5	94.028	12.570
67.5	82.820	11.071	95	94.251	12.600
68	83.012	11.097	95.5	94.475	12.630
68.5	83.204	11.123	96	94.699	12.660
69	83.397	11.149	96.5	94.924	12.690
69.5	83.591	11.175	97	95.149	12.720
70	83.786	11.201	97.5	95.375	12.750
70.5	83.981	11.227	98	95.601	12.780
71	84.176	11.253	98.5	95.828	12.810
71.5	84.372	11.279	99	96.055	12.841
72	84.569	11.305	99.5	96.283	12.871
72.5	84.767	11.332	100	96.512	12.902
73	84.965	11.358			

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TABLE NO. 4.

POLARIZATION FROM POLARISCOPE READING, WITHOUT DILUTION, AND DEGREE BRIX.

For use with Solutions prepared with Dry Subacetate of Lead and Brix Hydrometers Standardized at 27½° C.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.														Polariscope Reading
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	
1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.25	1
2		0.52	0.52	0.52	0.52	0.52	0.52	0.51	0.51	0.51	0.51	0.51	0.51	0.51	2
3		0.78	0.78	0.78	0.78	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.76	0.76	3
4			1.04	1.04	1.03	1.03	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	4
5			1.30	1.30	1.29	1.29	1.29	1.29	1.28	1.28	1.28	1.28	1.27	1.27	4
6				1.56	1.55	1.55	1.55	1.54	1.54	1.54	1.53	1.53	1.53	1.53	6
7				1.81	1.81	1.81	1.80	1.80	1.80	1.79	1.79	1.79	1.78	1.78	7
8					2.07	2.07	2.06	2.06	2.05	2.05	2.05	2.04	2.04	2.03	8
9					2.33	2.32	2.32	2.31	2.31	2.31	2.30	2.30	2.29	2.29	9
10						2.58	2.58	2.57	2.57	2.56	2.56	2.55	2.55	2.54	10
11						2.84	2.83	2.83	2.82	2.82	2.81	2.81	2.80	2.80	11
12							3.09	3.09	3.08	3.07	3.07	3.06	3.06	3.05	12
13							3.35	3.34	3.34	3.33	3.32	3.32	3.31	3.30	13
14								3.60	3.59	3.59	3.58	3.57	3.57	3.56	14
15								3.86	3.85	3.84	3.84	3.83	3.82	3.81	15
16									4.11	4.10	4.09	4.08	4.07	4.07	16
17									4.36	4.36	4.35	4.34	4.33	4.32	17
18										4.61	4.60	4.59	4.58	4.58	18
19										4.87	4.86	4.85	4.84	4.83	19
20											5.11	5.10	5.09	5.08	20
21											5.37	5.36	5.35	5.34	21
22												5.61	5.60	5.59	22
23												5.87	5.86	5.85	23
24													6.11	6.10	24
25													6.37	6.35	25
26														6.61	26
27														6.86	27

Degree Brix from 0.5 to 4	
Tenths of Polariscope Reading.	Percent Sucrose.
0.1	0.03
0.2	0.05
0.3	0.08
0.4	0.10
0.5	0.13
0.6	0.16
0.7	0.18
0.8	0.21
0.9	0.23

Degree Brix from 4.5 to 14	
Tenths of Polariscope Reading.	Percent Sucrose.
0.1	0.03
0.2	0.05
0.3	0.08
0.4	0.10
0.5	0.13
0.6	0.15
0.7	0.18
0.8	0.20
0.9	0.23

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TABLE NO. 4—Continued.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.												Polariscope Reading
	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	
1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1
2	0.51	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	2
3	0.76	0.76	0.76	0.76	0.76	0.75	0.75	0.75	0.75	0.75	0.75	0.75	3
4	1.01	1.01	1.01	1.01	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	4
5	1.27	1.27	1.26	1.26	1.26	1.26	1.25	1.25	1.25	1.25	1.24	1.24	5
6	1.52	1.52	1.52	1.51	1.51	1.51	1.50	1.50	1.50	1.50	1.49	1.49	6
7	1.78	1.77	1.77	1.77	1.76	1.76	1.75	1.75	1.75	1.74	1.74	1.74	7
8	2.03	2.03	2.02	2.02	2.01	2.01	2.01	2.00	2.00	1.99	1.99	1.99	8
9	2.28	2.28	2.27	2.27	2.27	2.26	2.26	2.25	2.25	2.24	2.24	2.23	9
10	2.54	2.53	2.53	2.52	2.52	2.51	2.51	2.50	2.50	2.49	2.49	2.48	10
11	2.79	2.79	2.78	2.77	2.77	2.76	2.76	2.75	2.75	2.74	2.74	2.73	11
12	3.04	3.04	3.03	3.03	3.02	3.01	3.01	3.00	3.00	2.99	2.98	2.98	12
13	3.30	3.29	3.28	3.28	3.27	3.27	3.26	3.25	3.25	3.24	3.23	3.23	13
14	3.55	3.54	3.54	3.53	3.52	3.52	3.51	3.50	3.50	3.49	3.48	3.48	14
15	3.81	3.80	3.79	3.78	3.78	3.77	3.76	3.75	3.75	3.74	3.73	3.72	15
16	4.06	4.05	4.04	4.04	4.03	4.02	4.01	4.00	4.00	3.99	3.98	3.97	16
17	4.31	4.30	4.30	4.29	4.28	4.27	4.26	4.25	4.25	4.24	4.23	4.22	17
18	4.57	4.56	4.55	4.54	4.53	4.52	4.51	4.50	4.49	4.49	4.48	4.47	18
19	4.82	4.81	4.80	4.79	4.78	4.77	4.76	4.75	4.74	4.74	4.73	4.72	19
20	5.07	5.06	5.05	5.04	5.03	5.02	5.01	5.00	4.99	4.98	4.97	4.96	20
21	5.33	5.32	5.31	5.30	5.29	5.28	5.26	5.25	5.24	5.23	5.22	5.21	21
22	5.58	5.57	5.56	5.55	5.54	5.53	5.52	5.50	5.49	5.48	5.47	5.46	22
23	5.83	5.82	5.81	5.80	5.79	5.78	5.77	5.75	5.74	5.73	5.72	5.71	23
24	6.09	6.08	6.06	6.05	6.04	6.03	6.02	6.00	5.99	5.98	5.97	5.96	24
25	6.34	6.33	6.32	6.30	6.29	6.28	6.27	6.26	6.24	6.23	6.22	6.21	25
26	6.60	6.58	6.57	6.56	6.54	6.53	6.52	6.51	6.49	6.48	6.47	6.45	26
27	6.85	6.84	6.82	6.81	6.80	6.78	6.77	6.76	6.74	6.73	6.72	6.70	27
28	7.10	7.09	7.08	7.06	7.05	7.03	7.02	70.1	6.99	6.98	6.96	6.95	28
29	7.36	7.34	7.33	7.31	7.30	7.28	7.27	7.26	7.24	7.23	7.21	7.20	29
30		7.60	7.58	7.57	7.55	7.54	7.52	7.51	7.49	7.48	7.46	7.45	30
31		7.85	7.83	7.82	7.80	7.79	7.77	7.76	7.74	7.73	7.71	7.69	31
32			8.09	8.07	8.05	8.04	8.02	8.01	7.99	7.97	7.96	7.94	32
33			8.34	8.32	8.31	8.29	8.27	8.26	8.24	8.22	8.21	8.19	33
34				8.57	8.56	8.54	8.53	8.51	8.49	8.47	8.46	8.44	34
35				8.83	8.81	8.79	8.77	8.76	8.74	8.72	8.70	8.69	35
36					9.06	9.04	9.03	9.01	8.99	8.97	8.95	8.94	36
37					9.31	9.29	9.28	9.26	9.24	9.22	9.20	9.18	37
38						9.55	9.53	9.51	9.49	9.47	9.45	9.43	38
39						9.80	9.78	9.76	9.74	9.72	9.70	9.68	39
40							10.02	10.01	9.99	9.97	9.95	9.93	40
41							10.28	10.26	10.24	10.20	10.20	10.18	41
42								10.51	10.49	10.47	10.45	10.43	42
43								10.76	10.74	10.72	10.69	10.67	43
44									10.99	10.97	10.94	10.92	44
45									11.24	11.21	11.19	11.17	45
46									11.49	11.46	11.44	11.42	46
47										11.71	11.69	11.67	47
48										11.96	11.94	11.91	48
49											12.19	12.16	49
50											12.44	12.41	50
51												12.66	51
52												12.91	52

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TABLE NO. 4—Continued.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.												Polariscope Reading
	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	
10	2.48	2.47	2.47	2.46	2.46	2.45	2.45	2.44	2.44	2.43	2.43	2.42	10
11	2.72	2.72	2.71	2.71	2.70	2.70	2.69	2.69	2.68	2.68	2.67	2.67	11
12	2.97	2.97	2.96	2.95	2.95	2.94	2.94	2.93	2.93	2.92	2.91	2.91	12
13	3.22	3.21	3.21	3.20	3.19	3.19	3.18	3.18	3.17	3.16	3.16	3.15	13
14	3.47	3.46	3.45	3.45	3.44	3.43	3.43	3.42	3.41	3.41	3.40	3.39	14
15	3.72	3.71	3.70	3.69	3.69	3.68	3.67	3.66	3.66	3.65	3.64	3.63	15
16	3.96	3.96	3.95	3.94	3.93	3.92	3.92	3.91	3.90	3.89	3.88	3.88	16
17	4.21	4.20	4.19	4.19	4.18	4.17	4.16	4.15	4.14	4.14	4.13	4.12	17
18	4.46	4.45	4.44	4.43	4.42	4.41	4.41	4.40	4.39	4.38	4.37	4.36	18
19	4.71	4.70	4.69	4.68	4.67	4.66	4.65	4.64	4.63	4.62	4.61	4.60	19
20	4.95	4.94	4.93	4.92	4.91	4.90	4.90	4.89	4.88	4.87	4.86	4.85	20
21	5.20	5.19	5.18	5.17	5.16	5.15	5.14	5.13	5.12	5.11	5.10	5.09	21
22	5.45	5.44	5.43	5.42	5.41	5.40	5.38	5.37	5.36	5.35	5.34	5.33	22
23	5.70	5.69	5.67	5.66	5.65	5.64	5.63	5.62	5.61	5.60	5.58	5.57	23
24	5.95	5.93	5.92	5.91	5.90	5.89	5.87	5.86	5.85	5.84	5.83	5.81	24
25	6.19	6.18	6.17	6.16	6.14	6.13	6.12	6.11	6.09	6.08	6.07	6.06	25
26	6.44	6.43	6.42	6.40	6.39	6.38	6.36	6.35	6.34	6.32	6.31	6.30	26
27	6.69	6.68	6.66	6.65	6.63	6.62	6.61	6.59	6.58	6.57	6.55	6.54	27
28	6.94	6.92	6.91	6.89	6.88	6.87	6.85	6.84	6.83	6.81	6.80	6.78	28
29	7.18	7.17	7.16	7.14	7.13	7.11	7.10	7.08	7.07	7.05	7.04	7.03	29
30	7.43	7.42	7.40	7.39	7.37	7.36	7.34	7.33	7.31	7.30	7.28	7.27	30
31	7.68	7.66	7.65	7.63	7.62	7.60	7.59	7.57	7.56	7.54	7.53	7.51	31
32	7.93	7.91	7.90	7.88	7.86	7.85	7.83	7.82	7.80	7.78	7.77	7.75	32
33	8.17	8.16	8.14	8.13	8.11	8.09	8.08	8.06	8.04	8.03	8.01	8.00	33
34	8.42	8.41	8.39	8.37	8.36	8.34	8.32	8.30	8.29	8.27	8.25	8.24	34
35	8.67	8.65	8.64	8.62	8.60	8.58	8.57	8.55	8.53	8.51	8.50	8.48	35
36	8.92	8.90	8.88	8.86	8.85	8.83	8.81	8.79	8.78	8.75	8.74	8.72	36
37	9.17	9.15	9.13	9.11	9.09	9.07	9.06	9.04	9.02	9.00	8.98	8.96	37
38	9.41	9.39	9.38	9.36	9.34	9.32	9.30	9.28	9.26	9.24	9.23	9.21	38
39	9.66	9.64	9.62	9.60	9.58	9.56	9.55	9.53	9.51	9.49	9.47	9.45	39
40	9.91	9.89	9.87	9.85	9.83	9.81	9.79	9.77	9.75	9.73	9.71	9.69	40
41	10.16	10.14	10.12	10.10	10.08	10.06	10.03	10.01	9.99	9.97	9.95	9.93	41
42	10.40	10.38	10.36	10.34	10.32	10.30	10.28	10.26	10.24	10.22	10.20	10.18	42
43	10.65	10.63	10.61	10.59	10.57	10.55	10.52	10.50	10.48	10.46	10.44	10.42	43
44	10.90	10.88	10.86	10.83	10.81	10.79	10.77	10.75	10.73	10.70	10.68	10.66	44
45	11.15	11.13	11.10	11.08	11.06	11.04	11.01	10.99	10.97	10.95	10.92	10.90	45
46	11.40	11.37	11.35	11.33	11.30	11.28	11.26	11.24	11.21	11.19	11.17	11.14	46
47	11.64	11.62	11.60	11.57	11.55	11.53	11.50	11.48	11.46	11.43	11.41	11.39	47
48	11.89	11.87	11.84	11.82	11.80	11.77	11.75	11.72	11.70	11.68	11.65	11.63	48
49	12.14	12.11	12.09	12.07	12.04	12.02	11.99	11.97	11.94	11.92	11.90	11.87	49
50	12.39	12.36	12.34	12.31	12.29	12.26	12.24	12.21	12.19	12.16	12.14	12.11	50
51	12.63	12.61	12.58	12.56	12.53	12.51	12.48	12.46	12.43	12.41	12.38	12.36	51
52	12.88	12.86	12.83	12.80	12.78	12.75	12.73	12.70	12.68	12.65	12.62	12.60	52
53	13.13	13.10	13.08	13.05	13.02	13.00	12.97	12.95	12.92	12.89	12.87	12.84	53
54	13.38	13.35	13.32	13.30	13.27	13.24	13.22	13.19	13.16	13.14	13.11	13.08	54
55		13.60	13.57	13.54	13.52	13.49	13.46	13.43	13.41	13.38	13.36	13.33	55
56		13.84	13.82	13.79	13.76	13.73	13.71	13.68	13.65	13.62	13.60	13.57	56
57			14.06	14.04	14.01	13.98	13.95	13.92	13.89	13.87	13.84	13.81	57
58			14.31	14.28	14.25	14.22	14.20	14.17	14.14	14.11	14.08	14.05	58
59				14.53	14.50	14.47	14.44	14.41	14.38	14.35	14.32	14.29	59

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TABLE NO. 4—Continued.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.												Polariscope Reading
	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	
60				14.77	14.74	14.71	14.69	14.66	14.63	14.60	14.57	14.54	60
61					14.99	14.96	14.93	14.90	14.87	14.84	14.81	14.78	61
62					15.24	15.21	15.17	15.14	15.11	15.08	15.05	15.02	62
63					15.48	15.45	15.42	15.39	15.36	15.33	15.29	15.26	63
64						15.70	15.66	15.63	15.60	15.57	15.54	15.51	64
65						15.94	15.91	15.88	15.84	15.81	15.78	15.75	65
66							16.15	16.12	16.09	16.06	16.02	15.99	66
67							16.40	16.37	16.33	16.30	16.27	16.23	67
68								16.61	16.58	16.54	16.51	16.48	68
69								16.85	16.82	16.79	16.75	16.72	69
70									17.06	17.03	16.99	16.96	70
71									17.31	17.27	17.24	17.20	71
72										17.52	17.48	17.44	72
73										17.76	17.72	17.69	73
74										18.00	17.97	17.93	74
75											18.21	18.17	75
76											18.45	18.41	76
77												18.66	77
78												18.90	78

Degree Brix from 14.5 to 20	
Tenths of Polariscope Reading.	Percent Sucrose.
0.1	0.02
0.2	0.05
0.3	0.07
0.4	0.10
0.5	0.12
0.6	0.15
0.7	0.17
0.8	0.20
0.9	0.22

Degree Brix from 20.5 to 24	
Tenths of Polariscope Reading.	Percent Sucrose.
0.1	0.02
0.2	0.05
0.3	0.07
0.4	0.10
0.5	0.12
0.6	0.14
0.7	0.17
0.8	0.19
0.9	0.21

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TABLE NO. 4—Continued.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.										Polariscope Reading
	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	
25	6.04	6.03	6.02	6.01	6.00	5.98	5.97	5.96	5.95	5.93	25
26	6.29	6.27	6.26	6.25	6.24	6.22	6.21	6.20	6.18	6.17	26
27	6.53	6.51	6.50	6.49	6.48	6.46	6.45	6.44	6.42	6.41	27
28	6.77	6.76	6.74	6.73	6.71	6.70	6.69	6.67	6.66	6.65	28
29	7.01	7.00	6.98	6.97	6.95	6.94	6.93	6.91	6.90	6.88	29
30	7.25	7.24	7.22	7.21	7.19	7.18	7.16	7.15	7.14	7.12	30
31	7.50	7.48	7.46	7.45	7.43	7.42	7.40	7.39	7.37	7.36	31
32	7.74	7.72	7.71	7.69	7.67	7.66	7.64	7.63	7.61	7.60	32
33	7.98	7.96	7.95	7.93	7.91	7.90	7.88	7.87	7.85	7.83	33
34	8.22	8.20	8.19	8.17	8.15	8.14	8.12	8.10	8.09	8.07	34
35	8.46	8.45	8.43	8.41	8.39	8.38	8.36	8.34	8.32	8.31	35
36	8.70	8.69	8.67	8.65	8.63	8.62	8.60	8.58	8.56	8.54	36
37	8.95	8.93	8.91	8.89	8.87	8.85	8.84	8.82	8.80	8.78	37
38	9.19	9.17	9.15	9.13	9.11	9.09	9.08	9.06	9.04	9.02	38
39	9.43	9.41	9.39	9.37	9.35	9.33	9.31	9.30	9.28	9.26	39
40	9.67	9.65	9.63	9.61	9.59	9.57	9.55	9.53	9.51	9.49	40
41	9.91	9.89	9.87	9.85	9.83	9.81	9.79	9.77	9.75	9.73	41
42	10.16	10.13	10.11	10.09	10.07	10.05	10.03	10.01	9.99	9.97	42
43	10.40	10.38	10.35	10.33	10.31	10.29	10.27	20.25	10.23	10.21	43
44	10.64	10.62	10.60	10.57	10.55	10.53	10.51	10.49	10.47	10.44	44
45	10.88	10.86	10.84	10.81	10.79	10.77	10.75	10.73	10.70	10.68	45
46	11.12	11.10	11.08	11 05	11.03	11.01	10.99	10.96	10.94	10.92	46
47	11.36	11.34	11.32	11.29	11.27	11.25	11.23	11.20	11.18	11.16	47
48	11.61	11.58	11.56	11.53	11.51	11.49	11.46	11.44	11.42	11.39	48
49	11.85	11.82	11.80	11.76	11.75	11.73	11.70	11.68	11.65	11.63	49
50	12.09	12.06	12.04	12.02	11.99	11.97	11.94	11.92	11.89	11.87	50
51	12.33	12.31	12.28	12.26	12.23	12.21	12.18	12.16	12.13	12.11	51
52	12.57	12.55	12.52	12.50	12.47	12.44	12.42	12.39	12.37	12.34	52
53	12.81	12.79	12.76	12.74	12.71	12.68	12.66	12.63	12.61	12.58	53
54	13.06	13.03	13.00	12.98	12.95	12.92	12.90	12.87	12.84	12.82	54
55	13.30	13.27	13.24	13.22	13.19	13.16	13.14	13.11	13.08	13.05	55
56	13.54	13.51	13.48	13.46	13.43	13.40	13.37	13.35	13.32	13.29	56
57	13.78	13.75	13.73	13.70	13.67	13.64	13.61	13.59	13.56	13.53	57
58	14.02	13.99	13.97	13.94	13.91	13.88	13.85	13.82	13.80	13.77	58
59	14.27	14.24	14.21	14.18	14.15	14.12	14.09	14.06	14.03	14.00	59
60	14.51	14.48	14.45	14.42	14.39	14.36	14.33	14.30	14.27	14.24	60
61	14.75	14.72	14.69	14.66	14.63	14.60	14.57	14.54	14.51	14.48	61
62	14.99	14.96	14.93	14.90	14.87	14.84	14.81	14.78	14.75	14.72	62
63	15.23	15.20	15.17	15.14	15.11	15.08	15.05	15.02	14.98	14.95	63
64	15.47	15.44	15.41	15.38	15.35	15.32	15.29	15.25	15.22	15.19	64
65	15.72	15.68	15.65	15.62	15.59	15.56	15.52	15.49	15.46	15.43	65
66	15.96	15.93	15.89	15.86	15.83	15.80	15.76	15.73	15.70	15.67	66
67	16.20	16.17	16.13	16.10	16.07	16.03	16.00	15.97	15.94	15.90	67
68	16.44	16.41	16.37	16.34	16.31	16.27	16.24	16.21	16.17	16.14	68
69	16.68	16.65	16.62	16.58	16.55	16.51	16.48	16.45	16.41	16.38	69

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TABLE NO. 4—Continued.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.										Polariscope Reading
	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	
70	16.93	16.89	16.86	16.82	16.79	16.75	16.72	16.68	16.65	16.61	70
71	17.17	17.13	17.10	17.06	17.03	16.99	16.96	16.92	16.89	16.85	71
72	17.41	17.37	17.34	17.30	17.27	17.23	17.20	17.16	17.13	17.09	72
73	17.65	17.61	17.58	17.54	17.51	17.47	17.43	17.40	17.36	17.33	73
74	17.89	17.86	17.82	17.78	17.75	17.71	17.67	17.64	17.60	17.56	74
75	18.13	18.10	18.06	18.02	17.99	17.95	17.91	17.88	17.84	17.80	75
76	18.38	18.34	18.30	18.26	18.23	18.19	18.15	18.11	18.08	18.04	76
77	18.62	18.58	18.54	18.50	18.47	18.43	18.39	18.35	18.31	18.28	77
78	18.86	18.82	18.78	18.74	18.71	18.67	18.63	18.59	18.55	18.51	78
79	19.10	19.06	19.02	18.98	18.95	18.91	18.87	18.83	18.79	18.75	79
80	19.34	19.30	19.26	19.22	19.19	19.15	19.11	19.07	19.03	18.99	80
81		19.54	19.50	19.46	19.43	19.39	19.35	19.31	19.27	19.24	81
82		19.79	19.75	19.71	19.66	19.62	19.58	19.54	19.50	19.46	82
83			19.99	19.95	19.90	19.86	19.82	19.78	19.74	19.70	83
84			20.23	20.19	20.14	20.10	20.06	20.02	19.98	19.94	84
85			20.47	20.43	20.38	20.34	20.30	20.26	20.22	20.18	85
86				20.67	20.62	20.58	20.54	20.50	20.45	20.41	86
87				20.91	20.86	20.82	20.78	20.74	20.69	20.65	87
88					21.10	21.06	21.02	20.97	20.93	20.89	88
89					21.34	21.30	21.26	21.21	21.17	21.12	89
90						21.54	21.49	21.45	21.41	21.36	90
91						21.78	21.73	21.69	21.64	21.60	91
92							21.97	21.93	21.88	21.84	92
93							22.21	22.17	22.12	22.07	93
94							22.45	22.40	22.36	22.31	94
95								22.64	22.60	22.55	95
96								22.88	22.83	22.79	96
97									23.07	23.02	97
98									23.31	23.26	98
99										23.50	99
101										23.74	100
101										23.97	101

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TABLE NO. 4—Concluded.

Comparison of Brix at 27½° with Sp. Gr. $\frac{27.5°}{27.5°}$

Brix.	Sp. Gr. $\frac{27.5°}{27.5°}$	Brix.	Sp. Gr. $\frac{27.5°}{27.5°}$	Brix.	Sp. Gr. $\frac{27.5°}{27.5°}$
0.5	1.00194	8.5	1.03370	16.5	1.06723
1.0	1.00389	9.0	1.03574	17.0	1.06940
1.5	1.00583	9.5	1.03779	17.5	1.07157
2.0	1.00778	10.0	1.03984	18.0	1.07374
2.5	1.00974	10.5	1.04191	18.5	1.07593
3.0	1.01169	11.0	1.04397	19.0	1.07812
3.5	1.01366	11.5	1.04605	19.5	1.08032
4.0	1.01564	12.0	1.04813	20.0	1.08253
4.5	1.01762	12.5	1.05023	20.5	1.08475
5.0	1.01960	13.0	1.05232	21.0	1.08697
5.5	1.02160	13.5	1.05443	21.5	1.08920
6.0	1.02360	14.0	1.05654	22.0	1.09144
6.5	1.02561	14.5	1.05867	22.5	1.09369
7.0	1.02762	15.0	1.06080	23.0	1.09595
7.5	1.02964	15.5	1.06294	23.5	1.09821
8.0	1.03167	16.0	1.06508	24.0	1.10048

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TABLE NO. 5.

TABLE FOR ESTIMATING TONS OF CANE REQUIRED FOR ONE TON OF SUGAR ("QUALITY RATIO.") BASED ON ANALYSIS OF FIRST MILL JUICE

Polarization of Juice

APPARENT PURITY OF JUICE

	78.0	78.5	79.0	79.5	80.0	80.5	81.0	81.5	82.0	82.5	83.0	83.5	84.0	84.5	85.0	85.5	86.0
12.0	11.73	11.69	11.66	11.61	11.57	11.52	11.49	11.45	11.42	11.38	11.35	11.30	11.27	11.22	11.20	11.17	11.13
12.1	11.63	11.60	11.56	11.51	11.48	11.43	11.40	11.36	11.32	11.29	11.25	11.20	11.17	11.13	11.11	11.07	11.04
12.2	11.54	11.50	11.47	11.42	11.38	11.33	11.30	11.26	11.23	11.20	11.16	11.11	11.10	11.04	11.01	10.98	10.95
12.3	11.45	11.40	11.37	11.32	11.29	11.24	11.21	11.17	11.14	11.11	11.07	11.02	11.00	10.95	10.92	10.90	10.86
12.4	11.35	11.31	11.28	11.23	11.20	11.15	11.12	11.08	11.05	11.01	10.98	10.93	10.91	10.86	10.84	10.80	10.77
12.5		11.23	11.19	11.14	11.11	11.06	11.03	10.99	10.96	10.93	10.90	10.85	10.82	10.78	10.75	10.72	10.69
12.6		11.13	11.10	11.05	11.02	10.97	10.95	10.90	10.87	10.84	10.81	10.76	10.74	10.69	10.67	10.63	10.60
12.7		11.05	11.01	10.97	10.94	10.89	10.86	10.82	10.79	10.75	10.72	10.67	10.65	10.60	10.56	10.55	10.51
12.8		10.96	10.93	10.88	10.85	10.80	10.77	10.73	10.70	10.67	10.64	10.59	10.55	10.51	10.48	10.45	10.41
12.9		10.87	10.84	10.80	10.77	10.72	10.68	10.65	10.62	10.59	10.55	10.51	10.48	10.45	10.41	10.39	10.35
13.0			10.76	10.71	10.68	10.64	10.60	10.57	10.54	10.50	10.47	10.43	10.41	10.36	10.34	10.31	10.26
13.1			10.68	10.63	10.60	10.55	10.53	10.49	10.46	10.42	10.40	10.35	10.33	10.28	10.26	10.23	10.20
13.2			10.60	10.55	10.52	10.48	10.45	10.41	10.38	10.35	10.33	10.27	10.25	10.20	10.18	10.15	10.12
13.3			10.52	10.47	10.44	10.40	10.37	10.33	10.30	10.27	10.24	10.19	10.17	10.12	10.10	10.07	10.04
13.4			10.44	10.40	10.36	10.32	10.29	10.25	10.23	10.20	10.16	10.13	10.10	10.05	10.03	10.00	9 98
13.5				10.32	10.29	10.25	10.21	10.18	10.15	10.12	10.09	10.04	10.02	10.00	9.97	9.94	9.91
13.6				10.24	10.21	10.17	10.14	10.10	10.07	10.04	10.01	9.97	9.95	9.91	9.88	9.85	9.82
13.7				10.17	10.14	10.10	10.07	10.03	10.00	9.97	9.94	9.90	9.87	9.84	9.81	9.79	9.76
13.8				10.10	10.06	10.03	9.99	9.96	9.93	9.90	9.87	9.83	9.80	9.76	9.74	9.71	9.68
13.9				10.02	9.99	9.95	9.93	9.88	9.86	9.83	9.80	9.76	9.73	9.69	9.67	9.64	9.61
14.0					9.92	9.88	9.85	9.81	9.78	9.76	9.73	9.69	9.66	9.62	9.60	9.57	9.54
14.1					9.85	9.81	9.78	9.74	9.72	9.67	9.66	9.62	9.60	9.55	9.53	9.50	9.47
14.2					9.78	9.74	9.71	9.68	9.65	9.62	9.59	9.55	9.53	9.50	9.47	9.44	9.42
14.3					9.71	9.66	9.64	9.61	9.58	9.55	9.52	9.48	9.46	9.43	9.41	9.38	9.36
14.4					9.65	9.60	9.58	9.54	9.51	9.49	9.46	9.42	9.39	9.35	9.33	9.30	9.28
14.5						9.54	9.51	9.48	9.45	9.42	9.39	9.35	9.33	9.29	9.27	9.24	9.21
14.6						9.47	9.44	9.41	9.38	9.36	9.33	9.29	9.27	9.22	9.20	9.18	9.15
14.7						9.41	9.38	9.33	9.32	9.29	9.27	9.22	9.20	9.16	9.14	9.12	9.09
14.8						9.34	9.32	9.28	9.26	9.23	9.20	9.16	9.14	9.10	9.08	9.05	9.03
14.9						9.28	9.25	9.22	9.19	9.17	9.14	9.10	9.08	9.04	9.02	8.99	8.96
15.0							9.19	9.16	9.13	9.11	9.08	9.04	9.02	8.98	8.96	8.93	8.90
15.1							9.13	9.10	9.07	9.05	9.02	8.98	8.96	8.92	8.90	8.87	8.84
15.2							9.07	9.04	9.01	8.99	8.96	8.92	8.90	8.86	8.84	8.81	8.78
15.3							9.01	8.98	8.95	8.93	8.90	8.86	8.84	8.80	8.78	8.75	8.72
15.4							8.95	8.92	8.90	8.87	8.84	8.81	8.79	8.74	8.73	8.70	8.67
15.5								8.86	8.84	8.81	8.78	8.75	8.72	8.68	8.67	8.64	8.61
15.6								8.80	8.78	8.75	8.72	8.69	8.67	8.62	8.61	8.58	8.56
15.7								8.75	8.73	8.70	8.67	8.64	8.62	8.58	8.56	8.54	8.51
15.8								8.69	8.67	8.64	8.61	8.59	8.58	8.53	8.51	8.49	8.46
15.9								8.64	8.62	8.59	8.56	8.53	8.51	8.47	8.45	8.43	8.41
16.0									8.56	8.54	8.51	8.48	8.46	8.42	8.40	8.38	8.36
16.1									8.51	8.48	8.45	8.42	8.40	8.36	8.34	8.32	8.30
16.2									8.45	8.43	8.40	8.37	8.35	8.81	8.29	8.27	8.25
16.3									8.39	8.37	8.34	8.31	8.29	8.25	8.23	8.21	8.19
16.4									8.35	8.33	8.30	8.27	8.25	8.21	8.19	8.17	8.15
16.5										8.28	8.25	8.22	8.19	8.16	8.14	8.12	8.10
16.6										8.23	8.20	8.17	8.14	8.11	8.09	8.07	8.05
16.7										8.18	8.15	8.12	8.10	8.06	8.05	8.02	8.00
16.8										8.13	8.10	8.06	8.05	8.02	8.00	7.98	7.96
16.9										8.08	8.05	8.02	8.01	7.97	7.95	7.93	7.91

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TABLE NO. 5—Continued.

Polarization of Juice	TABLE FOR ESTIMATING TONS OF CANE REQUIRED FOR ONE TON OF SUGAR APPARENT PURITY OF JUICE																
	86.5	87.0	87.5	88.0	88.5	89.0	89.5	90.0	90.5	91.0	91.5	92.0	92.5	93.0	93.5	94.0	94.5
12.0	11.11	11.07	11.05	11.01	10.99	10.95	10.94	10.90									
12.1	11.01	10.68	10.96	10.92	10.90	10.87	10.84	10.80									
12.2	10.92	10.90	10.87	10.84	10.81	10.78	10.75	10.71									
12.3	10.83	10.81	10.78	10.74	10.72	10.69	10.66	10.62									
12.4	10.74	10.72	10.70	10.65	10.64	10.60	10.58	10.54									
12.5	10.64	10.63	10.61	10.57	10.55	10.52	10.50	10.46	10.44								
12.6	10.56	10.55	10.52	10.48	10.47	10.44	10.41	10.37	10.36								
12.7	10.50	10.47	10.44	10.40	10.38	10.35	10.34	10.28	10.27								
12.8	10.39	10.38	10.36	10.32	10.30	10.28	10.25	10.21	10.20								
12.9	10.31	10.30	10.28	10.24	10.22	10.20	10.17	10.13	10.11								
13.0	10.23	10.22	10.20	10.16	10.14	10.11	10.09	10.05	10.03	10.01							
13.1	10.15	10.14	10.12	10.08	10.07	10.04	10.02	9.98	9.96	9.94							
13.2	10.10	10.07	10.04	10.00	9.99	9.96	9.94	9.90	9.88	9.86							
13.3	10.00	9.99	9.97	9.94	9.92	9.89	9.86	9.82	9.81	9.79							
13.4	9.95	9.92	9.89	9.86	9.84	9.81	9.79	9.75	9.74	9.71							
13.5	9.88	9.85	9.82	9.79	9.75	9.74	9.72	9.68	9.67	9.64	9.62						
13.6	9.80	9.77	9.75	9.71	9.70	9.67	9.65	9.61	9.60	9.57	9.54						
13.7	9.73	9.70	9.68	9.64	9.63	9.60	9.58	9.54	9.52	9.50	9.48						
13.8	9.66	9.63	9.61	9.57	9.56	9.53	9.50	9.47	9.46	9.43	9.41						
13.9	9.59	9.56	9.54	9.50	9.49	9.46	9.44	9.40	9.39	9.37	9.34						
14.0	9.52	9.49	9.47	9.44	9.42	9.39	9.37	9.34	9.32	9.30	9.07	9.23					
14.1	9.44	9.42	9.40	9.37	9.35	9.33	9.30	9.27	9.25	9.24	9.21	9.17					
14.2	9.40	9.37	9.35	9.32	9.29	9.26	9.24	9.20	9.19	9.16	9.14	9.11					
14.3	9.32	9.29	9.27	9.24	9.22	9.20	9.17	9.14	9.12	9.10	9.28	9.04					
14.4	9.24	9.23	9.21	9.17	9.16	9.13	9.11	9.08	9.06	9.04	9.01	8.98					
14.5	9.19	9.17	9.14	9.11	9.10	9.07	9.05	9.01	9.00	8.98	8.95	8.92	8.90				
14.6	9.13	9.10	9.08	9.05	9.03	9.01	8.99	8.95	8.94	8.92	8.89	8.86	8.84				
14.7	9.06	9.04	9.02	8.99	8.96	8.94	8.92	8.89	8.88	8.86	8.83	8.79	8.78				
14.8	9.00	8.98	8.96	8.92	8.91	8.88	8.87	8.83	8.82	8.80	8.77	8.74	8.72				
14.9	8.92	8.91	8.90	8.86	8.85	8.82	8.80	8.77	8.76	8.74	8.72	8.68	8.66				
15.0	8.89	8.86	8.84	8.81	8.79	8.77	8.75	8.71	8.70	8.68	8.65	8.62	8.61	8.59			
15.1	8.83	8.80	8.78	8.75	8.73	8.71	8.69	8.65	8.64	8.62	8.60	8.56	8.55	8.53			
15.2	8.77	8.74	8.72	8.69	8.67	8.65	8.63	8.59	8.58	8.57	8.54	8.50	8.49	8.47			
15.3	8.71	8.68	8.66	8.63	8.61	8.59	8.58	8.53	8.52	8.51	8.48	8.44	8.43	8.41			
15.4	8.66	8.63	8.61	8.58	8.57	8.54	8.52	8.49	8.47	8.46	8.43	8.40	8.38	8.36			
15.5	8.60	8.57	8.55	8.52	8.51	8.48	8.46	8.43	8.41	8.40	8.37	8.34	8.32	8.30	8.28		
15.6	8.54	8.51	8.49	8.46	8.45	8.42	8.40	8.37	8.56	8.34	8.31	8.28	8.26	8.24	8.22		
15.7	8.49	8.46	8.45	8.41	8.40	8.38	8.36	8.33	8.31	8.29	8.27	8.24	8.22	8.20	8.19		
15.8	8.44	8.41	8.39	8.36	8.35	8.33	8.30	8.27	8.26	8.24	8.22	8.18	8.17	8.15	8.13		
15.9	8.38	8.35	8.33	8.31	8.30	8.27	8.25	8.22	8.21	8.19	8.16	8.13	8.12	8.10	8.08		
16.0	8.33	8.31	8.29	8.26	8.24	8.22	8.20	8.17	8.16	8.15	8.11	8.08	8.07	8.05	8.03	8.01	
16.1	8.28	8.26	8.24	8.21	8.19	8.16	8.14	3.11	8.10	8.09	8.05	8.02	8.01	7.99	7.97	7.95	
16.2	8.23	8.20	8.18	8.15	8.13	8.12	8.10	8.07	8.06	8.04	8.01	7.98	7.97	7.95	7.93	7.91	
16.3	8.18	8.15	8.14	8.10	8.09	8.07	8.05	8.02	8.01	7.99	7.96	7.93	7.92	7.90	7.88	7.86	
16.4	8.13	8.11	8.09	8.05	8.04	8.02	8.00	7.97	7.96	7.94	7.91	7.88	7.87	7.85	7.83	7.81	
16.5	8.08	8.05	8.04	8.01	7.98	7.96	7.94	7.92	7.91	7.89	7.87	7.84	7.82	7.81	7.79	7.77	7.76
16.6	8.03	8.00	7.99	7.96	7.93	7.92	7.90	7.89	7.86	7.84	7.82	7.79	7.78	7.76	7.74	7.72	7.71
16.7	7.98	7.96	7.94	7.91	7.90	7.87	7.85	7.82	7.81	7.79	7.77	7.74	7.73	7.71	7.69	7.68	7.66
16.8	7.94	7.91	7.90	7.87	7.85	7.82	7.81	7.79	7.77	7.74	7.73	7.71	7.69	7.68	7.66	7.64	7.62
16.9	7.90	7.87	7.85	7.82	7.81	7.78	7.77	7.74	7.73	7.71	7.69	7.65	7.64	7.62	7.60	7.59	7.51

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TABLE NO. 5—Continued.

Polarization of Juice	TABLE FOR ESTIMATING TONS OF CANE REQUIRED FOR ONE TON SUGAR — APPARENT PURITY OF JUICE														
	83.0	83.5	84.0	84.5	85.0	85.5	86.0	86.5	87.0	87.5	88.0	88.5	89.0	89.5	90.0
17.0	8.00	7.98	7.96	7.93	7.91	7.90	7.88	7.83	7.82	7.80	7.77	7.76	7.74	7.72	7.69
17.1	7.96	7.93	7.91	7.90	7.88	7.83	7.82	7.79	7.77	7.76	7.74	7.72	7.69	7.68	7.66
17.2		7.90	7.88	7.83	7.82	7.79	7.77	7.76	7.74	7.72	7.69	7.68	7.66	7.64	7.61
17.3		7.85	7.82	7.79	7.77	7.76	7.74	7.71	7 68	7.66	7.64	7.62	7.60	7.58	7.55
17.4			7.80	7.76	7.74	7.71	7.68	7.66	7.64	7.62	7.60	7.58	7.55	7.54	7.53
17.5			7.73	7.71	7.68	7.66	7.64	7.62	7.60	7.58	7.55	7.54	7.53	7.50	7.47
17.6			7.69	7.66	7.64	7.62	7.60	7.58	7.55	7.54	7.53	7.50	7.47	7.46	7.44
17.7			7.64	7.62	7.60	7.58	7.55	7.53	7.51	7.49	7.46	7.45	7.43	7.41	7.38
17.8			7.59	7.57	7.55	7.53	7.51	7.49	7.46	7.45	7.43	7.41	7.38	7.37	7.35
17.9			7.56	7.53	7.51	7.49	7.46	7.45	7.43	7.41	7.38	7.37	7.35	7.33	7.30
18.0				7.49	7.47	7.44	7.42	7.41	7.38	7.37	7.34	7.33	7.31	7.29	7.26
18.1				7.44	7.42	7.40	7.38	7.36	7.34	7.33	7.30	7.29	7.26	7.25	7.22
18.2				7.41	7.38	7.36	7.34	7.31	7.30	7.29	7.26	7.25	7.22	7.21	7.18
18.3				7.36	7.34	7.32	7.30	7.28	7.26	7.25	7.22	7.21	7.19	7.17	7.14
18.4				7.32	7.30	7.28	7.26	7.24	7.22	7.21	7.18	7.17	7.15	7.13	7.10
18.5					7.26	7.24	7.22	7.20	7.18	7.17	7.14	7.13	7.11	7.09	7.06
18.6					7.24	7.22	7.20	7.18	7.16	7.14	7.11	7.09	7.07	7.05	7.04
18 7					7.20	7.18	7.16	7.14	7.11	7.09	7.07	7.06	7.04	7 02	7.00
18.8					7.16	7.14	7.11	7.09	7.08	7.07	7.06	7.05	7.03	7.01	6.99
18.9					7.11	7.09	7.08	7.05	7.03	7.02	6.99	6.98	6.96	6.94	6.91
19.0						7.06	7.05	7.02	6.99	6.98	6.95	6.94	6.92	6.91	6.88
19.1						7.02	6.99	6.98	6.96	6.94	6.91	6.90	6.88	6.87	6.84
19 2						6.98	6.96	6.94	6.92	6.91	6.88	6.87	6.85	6.83	6.81
19.3						6.94	6.92	6.91	6.89	6.87	6.84	6.83	6.81	6.80	6.77
19.4						6.91	6.90	6.87	6.85	6.84	6.81	6.80	6.77	6.76	6.75
19.5							6.85	6.84	6.82	6.80	6.77	6.76	6.74	6.73	6.70
19.6							6.82	6.80	6.77	6.76	6.74	6.73	6.70	6.69	6.68
19.7							6.79	6.77	6.74	6.73	6.72	6.69	6.67	6.66	6.63
19.8							6.74	6.73	6.71	6.70	6.67	6.66	6.64	6.63	6.60
19.9							6.73	6.70	6.68	6.66	6.64	6.63	6.61	6.59	6.57
20.0								6.66	6.65	6.63	6.60	6.59	6.57	6.56	6.53
20.1								6.63	6.60	6.59	6.57	6.56	6.53	6.52	6.51
20.2								6.60	6.58	6.56	6.54	6.53	6.51	6.49	6.47
20.3								6.57	6.55	6.53	6.51	6.49	6.47	6.46	6.44
20.4								6.53	6.52	6.50	6.47	6.46	6.45	6.43	6.41
20.5									6.48	6.46	6.45	6.43	6.41	6.40	6.38
20.6									6.45	6.44	6.41	6.40	6.38	6.37	6.34
20.7									6.42	6.41	6.38	6.37	6.34	6.33	6.32
20.8									6.38	6.37	6.35	6.34	6.33	6.30	6.28
20.9									6.36	6.34	6.32	6.31	6.29	6.28	6.25
21.0										6.31	6.29	6.28	6.26	6.25	6.22
21.1										6.28	6.26	6.25	6.22	6.21	6.20
21.2										6.25	6.24	6.21	6.20	6.18	6.16
21.3										6.23	6.21	6.19	6.17	6.16	6.15
21.4										6.19	6.18	6.17	6.15	6.13	6.11
21.5											6.14	6.13	6.12	6.10	6.08
21.6											6.13	6.12	6.10	6.08	6.07
21.7											6.09	6.08	6.06	6.05	6.02
21.8											6.08	6.06	6.05	6.02	6.01
21.9											6.03	6.02	6.00	5.99	5.97

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TABLE NO. 5—Concluded.

Polarization of Juice	TABLE FOR ESTIMATING TONS OF CANE REQUIRED FOR ONE TON SUGAR													
	APPARENT PURITY OF JUICE													
	90.5	91.0	91.5	92.0	92.5	93.0	93.5	94.0	94.5	95.0	95.5	96.0	96.5	97.0
17.0	7.68	7.66	7.64	7.61	7.59	7.58	7.56	7.54	7.53	7.52				
17.1	7.64	7.61	7.59	7.58	7.56	7.54	7.53	7.51	7.50	7.48				
17.2	7.59	7.58	7.56	7.54	7.53	7.51	7.50	7.48	7.46	7.44				
17.3	7.54	7.53	7.50	7.47	7.46	7.44	7.43	7.41	7.40	7.39				
17.4	7.50	7.47	7.46	7.44	7.43	7.41	7.40	7.38	7.36	7.34				
17.5	7.46	7.44	7.43	7.41	7.40	7.38	7.36	7.34	7.32	7.30	7.28			
17.6	7.43	7.41	7.40	7.38	7.34	7.32	7 30	7.28	7.27	7.25	7.24			
17.7	7.37	7.35	7.33	7.30	7.29	7.28	7.26	7.24	7.23	7.22	7.20			
17.8	7.33	7.30	7.29	7.28	7.26	7.24	7.23	7.21	7.20	7.18	7.16			
17.9	7.29	7.28	7.26	7.24	7.23	7.21	7.20	7.18	7.16	7.15	7.13			
18.0	7.25	7.23	7.21	7.18	7.17	7.16	7.14	7.12	7.11	7.09	7.07	7.05		
18.1	7.21	7.19	7.17	7.14	7.13	7.12	7.10	7.08	7.07	7.05	7.03	7.02		
18.2	7.17	7.15	7.13	7.10	7.09	7.08	7 06	7.04	7.03	7.02	6.99	6.98		
18.3	7.13	7.11	7.09	7.07	7.05	7.04	7.02	7.01	6.99	6.98	6.95	6.94		
18.4	7.09	7.07	7.05	7.03	7.02	7.00	6.98	6.97	6.96	6.94	6.91	6.90		
18.5	7.05	7.03	7.02	6.99	6.98	6.96	6.95	6.93	6.92	6.90	6.88	6.86	6.85	
18.6	7.02	6.99	6.97	6.95	6.94	6.92	6.91	6.89	6.88	6.86	6.85	6.84	6.81	
18.7	6.99	6.97	6.95	6.93	6.91	6.90	6.88	6.86	6.85	6.84	6.81	6.80	6.77	
18.8	6.98	6.96	6.94	6.92	6.90	6.89	6.87	6.85	6.84	6.83	6.80	6.79	6.76	
18.9	6.90	6.89	6.87	6.84	6.83	6.81	6.80	6.78	6.77	6.76	6.73	6.72	6.70	
19.0	6.87	6.85	6.83	6.81	6.79	6.78	6.76	6.75	6.74	6.72	6.69	6.68	6.67	6.66
19.1	6.83	6.82	6.80	6.77	6.76	6.74	6.73	6.71	6.70	6.68	6.66	6.65	6.63	6.62
19.2	6.80	6.78	6.76	6.73	6.72	6.71	6.69	6.68	6.67	6.65	6.62	6.61	6.60	6.59
19.3	6.76	6.75	6.73	6.70	6.69	6.67	6.66	6.64	6.63	6.62	6.59	6.58	6.57	6.55
19.4	6.73	6.70	6.69	6.67	6.66	6.64	6.63	6.62	6.59	6.58	6.57	6.55	6.53	6.52
19.5	6.69	6.68	6.66	6.63	6.62	6.61	6.59	6.57	6.56	6.55	6.52	6.51	6.50	6.49
19.6	6.66	6.63	6.62	6.61	6.59	6.57	6.56	6.55	6.52	6.51	6.50	6.49	6.46	6.45
19.7	6.62	6.61	6.59	6.56	6.55	6.54	6.52	6.51	6.50	6.48	6.46	6.45	6.43	6.42
19.8	6.59	6.58	6.56	6.53	6.52	6.50	6.49	6.47	6.46	6.45	6.42	6.41	6.40	6.39
19.9	6.56	6.54	6.52	6.50	6.49	6.47	6.46	6.44	6.43	6.42	6.39	6.38	6.37	6.36
20.0	6.52	6.51	6.47	6.46	6.45	6.44	6.42	6.41	6.40	6.38	6.36	6.35	6.33	6.32
20.1	6.47	6.46	6.45	6.44	6.42	6.41	6.40	6.38	6.36	6.35	6.33	6.32	6.31	6.29
20.2	6.46	6.44	6.42	6.40	6.39	6.38	6.36	6.34	6.33	6.32	6.30	6.29	6.27	6.26
20.3	6.42	6.40	6.39	6.38	6.36	6.34	6.33	6.32	6.30	6.29	6.27	6.26	6.24	6.23
20.4	6.40	6.38	6.36	6.34	6.33	6.31	6.30	6.28	6.27	6.26	6.23	6.22	6.21	6.20
20.5	6.36	6.34	6.33	6.31	6.30	6.28	6.27	6.26	6.23	6.22	6.21	6.20	6.18	6.17
20.6	6.33	6.32	6.30	6.28	6.27	6.25	6.24	6.22	6.21	6.20	6.17	6.16	6.15	6.14
20.7	6.30	6.28	6.27	6.25	6.24	6.22	6.21	6.20	6.17	6.16	6.15	6.14	6.13	6.11
20.8	6.27	6.25	6.24	6.22	6.21	6.20	6.18	6.16	6.15	6.14	6.13	6.11	6.09	6.08
20.9	6.24	6.22	6.21	6.19	6.18	6.16	6.15	6.14	6.13	6.11	6.09	6.08	6.06	6.05
21.0	6.21	6.20	6.18	6.16	6.15	6.13	6.12	6.10	6.09	6.08	6.06	6.05	6.03	6.02
21.1	6.18	6.16	6.15	6.13	6.12	6.10	6.09	6.08	6.06	6.05	6.03	6.02	6.01	6.00
21.2	6.15	6.14	6.13	6.11	6.10	6.08	6.06	6.05	6.03	6.02	6.01	6.00	5.98	5.97
21.3	6.13	6.12	6.11	6.09	6.06	6.05	6.03	6.02	6.01	6.00	5.98	5.97	5.95	5.94
21.4	6.10	6.08	6.06	6.04	6.03	6.02	6.00	5.99	5.98	5.97	5.94	5.93	5.92	5.91
21.5	6.07	6.05	6.04	6.01	6.00	5.99	5.98	5.96	5.95	5.94	5.93	5.92	5.91	5.89
21.6	6.05	6.04	6.01	6.00	5.99	5.98	5.96	5.95	5.94	5.93	5.92	5.91	5.89	5.87
21.7	6.01	6.00	5.98	5.96	5.95	5.94	5.92	5.91	5.90	5.88	5.86	5.85	5.84	5.83
21.8	5.00	5.98	5.96	5.95	5.94	5.92	5.91	5.90	5.88	5.86	5.85	5.84	5.83	5.80
21.9	6.96	5.95	5.94	5.93	5.92	5.91	5.90	5.88	5.86	5.85	5.84	5.83	5.80	5.77

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TABLE NO. 6.

TONS CANE REQUIRED TO MAKE ONE TON OF SUGAR.
BASED ON FACTORY DATA.

When Extraction is 96.5%. Apparent purity of syrup 88. Sugar 96.5 Polarization and 97.5 Purity. Final Molasses 37 Gravity Purity.

Polarization of Cane	Tons Cane Per Ton Sugar	Polarization of Cane	Tons Cane Per Ton Sugar
10.0	10.70	13.5	7.93
.1	.60	.6	.87
.2	.50	.7	.81
.3	.40	.8	.75
.4	.30	.9	70
.5	.20	14.0	.65
.6	.10	.1	.59
7	.01	.2	.54
.8	9.92	.3	.49
.9	.83	.4	.44
11.0	.74	.5	.39
.1	.65	.6	.34
.2	.56	.7	.29
.3	.47	.8	.24
.4	.39	.9	.19
.5	.31	15.0	.14
.6	.23	.1	.09
.7	.15	.2	.04
.8	.07	.3	6.99
.9	8.99	.4	.95
12.0	.92	.5	.91
.1	.85	.6	.86
.2	.78	.7	.81
.3	.71	.8	.77
.4	.64	.9	.73
.5	.57	16.0	.69
.6	.50	.1	.65
.7	.43	.2	.61
.8	.36	.3	.57
.9	.29	.4	.53
13.0	.23	.5	.49
.1	.17	.6	.45
.2	.11	.7	.41
.3	.05	.8	.37
.4	7.99	.9	.33
		17.0	.30

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TABLE NO 6—Concluded.

Amounts to be Added or Deducted for Syrup of Different Purity.

	App. Purity of Syrup	Polarization % Cane													
		10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.
Add	84	.39	.36	.34	.33	.33	.30	.30	.28	.27	.26	.25	.25	.24	
	85	.29	.27	.26	.24	.24	.23	.23	.21	.20	.19	.18	.18	.18	
	86	.19	.18	.17	.17	.16	.15	.15	.14	.13	.13	.12	.12	.12	
	87	.09	.08	.08	.08	.08	.07	.07	.07	.06	.06	.06	.06	.06	
	88	0	0	0	0	0	0	0	0	0	0	0	0	0	
ubtract	89	.08	.08	.08	.07	.07	.07	.06	.07	.06	.06	.06	.06	.05	
	90	.16	.16	.15	.14	.13	.13	.12	.12	.12	.11	.11	.11	.10	
	91	.25	.24	.23	.21	.20	.20	.18	.18	.18	.17	.16	.16	.15	
	92	.33	.31	.30	.28	.27	.26	.24	.24	.24	.23	.21	.21	.20	

For each 1.0% over 96.5 Extraction decrease Ton Cane per Ton Sugar by 1.0

For each 1.0% under 96.5 Extraction increase Tons Cane per Ton Sugar by 1.0

For 1.0% increase in polarization of sugar over 96.5° increase Tons Cane per Ton Sugar by 1.9

For 1.0% decrease in polarization of sugar under 96.5° decrease Tons Cane per Ton Sugar by . . . . . 1.

For 1.0° increase in purity of molasses increase Tons Cane per Ton Sugar by . . . . . 0.

For 1.0° decrease in purity of Molasses decrease Tons Cane per Sugar by . . . . . 0.

Example of Correction:

Extraction . . . . . 97.0 Syrup . . . . . Purity . . . . . .
Sugar Polarization . . . . . 97.0 Molasses . . . . . " . . . . . .
Polarization of Cane 14.0

Correction for decrease in Purity 88° to 87" . . . . . = + 0.0
" " increase in Polarization of sugar . . . . . = + 0.9
" " " " Purity of Molasses . . . . . = + 0.6
" " " " Extraction . . . . . = — 0.5

+ 1.0

7.65 + 0.06 = 7.71
7.71 x 1.03% = + .08

+ 7.79 Corrected Tons of Cane per Ton of Sugar

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TABLE NO. 7.

DRY SUBSTANCE FROM REFRACTIVE INDEX AT 28° C.

Index	Per Cent. Dry Substance.	Index.	Per cent. Dry Substance.	Index.	Per Cent. Dry Substance.	Index.	Per Cent. Dry Substance.
		1.3390	4.71	1.3450	8.69	1.3510	12.56
		91	4.79	51	8.75	11	12.63
1.3322	0.00	92	4.86	52	8.81	12	12.69
		93	4.93	53	8.88	13	12.75
		94	5.00	54	8.94	14	12.81
		95	5.07	55	9.00	15	12.88
1.3336	1.00	96	5.13	56	9.07	16	12.94
37	1.07	97	5.20	57	9.13	17	13.00
38	1.13	98	5.27	58	9.20	18	13.08
39	1.20	99	5.33	59	9.27	19	13.15
1.3340	1.27	1.3400	5.40	1.3460	9.35	1.3520	13.23
41	1.33	01	5.47	61	9.40	21	13.31
42	1.40	02	5.53	62	9.47	22	13.38
43	1.47	03	5.60	63	9.53	23	13.46
44	1.53	04	5.67	64	9.60	24	13.54
45	1.60	05	5.73	65	9.67	25	13.62
46	1.67	06	5.80	66	9.73	26	13.69
47	1.73	07	5.87	67	9.80	27	13.77
48	1.80	08	5.93	67	9.80	27	13.77
49	1.87	09	6.00	69	9.93	29	13.92
1.3350	1.93	1.3410	6.07	1.3470	10.00	1.3530	14.00
51	2.00	11	6.13	71	10.07	31	14.06
52	2.07	12	6.20	72	10.13	32	14.12
53	2.13	13	6.27	73	10.20	33	14.18
54	2.20	14	6.33	74	10.27	34	14.24
55	2.27	15	6.40	75	10.33	35	14.29
56	2.33	16	6.47	76	10.40	36	14.35
57	2.40	17	6.53	77	10.47	37	14.41
58	2.47	18	6.60	78	10.53	38	14.47
59	2.53	19	6.67	79	10.60	39	14.53
1.3360	2.60	1.3420	6.73	1.3480	10.67	1.3540	14.59
61	2.67	21	6.80	81	10.73	41	14.65
62	2.73	22	6.87	82	10.80	42	14.71
63	2.80	23	6.93	83	10.87	43	14.76
64	2.87	24	7.00	84	10.93	44	14.82
65	2.93	25	7.07	85	11.00	45	14.88
66	3.00	26	7.13	86	11.06	46	14.94
67	3.07	27	7.20	87	11.13	47	15.00
68	3.14	28	7.27	88	11.19	48	15.06
69	3.21	29	7.33	89	11.25	49	15.13
1.3370	3.29	1.3430	7.40	1.3490	11.31	1.3550	15.19
71	3.36	31	7.47	91	11.38	51	15.25
72	3.43	32	7.53	92	11.44	52	15.31
73	3.50	33	7.60	93	11.50	53	15.38
74	3.57	34	7.67	94	11.56	54	15.44
75	3.64	35	7.73	95	11.63	55	15.50
76	3.71	36	7.80	96	11.69	56	15.56
77	3.79	37	7.87	97	11.75	57	15.63
78	3.86	38	7.93	98	11.81	58	15.69
79	3.93	39	8.00	99	11.88	59	15.75
1.3380	4.00	1.3440	8.06	1.3500	11.94	1.3560	15.81
81	4.07	41	8.13	01	12.00	61	15.88
82	4.14	42	8.19	02	12.06	62	15.94
83	4.21	43	8.25	03	12.13	63	16.00
84	4.29	44	8.31	04	12.19	64	16.06
85	4.36	45	8.38	05	12.25	65	16.12
86	4.43	46	8.44	06	12.31	66	16.18
87	4.50	47	8.50	07	12.38	67	16.24
88	4.57	48	8.56	08	12.44	68	16.29
89	4.64	49	8.63	09	12.50	69	16.35

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TABLE NO. 7—Continued.

DRY SUBSTANCE FROM REFRACTIVE INDEX AT 28° C.
(*Continued.*)

Index	Per Cent. Dry Substance.	Index.	Per cent. Dry Substance.	Index.	Per Cent. Dry Substance.	Index.	Per Cent. Dry Substance.
1.3570	16.41	1.3630	20.06	1.3690	23.69	1.3750	27.18
71	16.47	31	20.13	91	23.75	51	27.24
72	16.53	32	20.19	92	23.81	52	27.29
73	16.59	33	20.25	93	23.88	53	27.35
74	16.65	34	20.31	94	23.94	54	27.41
75	16.71	35	20.38	95	24.00	55	27.47
76	16.76	36	20.44	96	24.06	56	27.53
77	16.82	37	20.50	97	24.12	57	27.59
78	16.88	38	20.56	98	24.18	58	27.65
79	16.94	39	20.63	99	24.24	59	27.71
1.3580	17.00	1.3640	20.69	1.3700	24.29	1.3760	27.76
81	17.06	41	20.75	01	24.35	61	27.82
82	17.13	42	20.81	02	24.41	62	27.88
83	17.19	43	20.88	03	24.47	63	27.94
84	17.25	44	20.94	04	24.53	64	28.00
85	17.31	45	21.00	05	24.59	65	28.06
86	17.38	46	21.06	06	24.65	66	28.11
87	17.44	47	21.12	07	24.71	67	28.17
88	17.50	48	21.18	08	24.76	68	28.22
89	17.56	49	21.24	09	24.82	69	28.28
1.3590	17.63	1.3650	21.29	1.3710	24.88	1.3770	28.33
91	17.69	51	21.35	11	24.94	71	28.39
92	17.75	52	21.41	12	25.00	72	28.44
93	17.81	53	21.47	13	25.06	73	28.50
94	17.88	54	21.53	14	25.12	74	28.56
95	17.94	55	21.59	15	25.18	75	28.61
96	18.00	56	21.65	16	25.24	76	28.67
97	18.06	57	21.71	17	25.29	77	28.72
98	18.13	58	21.76	18	25.35	78	28.78
99	18.19	59	21.82	19	25.41	79	28.83
1.3600	18.25	1.3660	21.88	1.3720	25.47	1.3780	28.89
01	18.31	61	21.94	21	25.53	81	28.94
02	18.38	62	22.00	22	25.59	82	29.00
03	18.44	63	22.06	23	25.65	83	29.06
04	18.50	64	22.12	24	25.71	84	29.11
05	18.56	65	22.18	25	25.76	85	29.17
06	18.63	66	22.24	26	25.82	86	29.22
07	18.69	67	22.29	27	25.88	87	29.28
08	18.75	68	22.35	28	25.94	88	29.33
09	18.81	69	22.41	29	26.00	89	29.39
1.3610	18.88	1.3670	22.47	1.3730	26.06	1.3790	29.44
11	18.94	71	22.53	31	26.11	91	29.50
12	19.00	72	22.59	32	26.17	92	29.56
13	19.06	73	22.65	33	26.22	93	29.61
14	19.12	74	22.71	34	26.28	94	29.67
15	19.18	75	22.76	35	26.33	95	29.72
16	19.24	76	22.82	36	26.39	96	29.78
17	19.29	77	22.88	37	26.44	97	29.83
18	19.35	78	22.94	38	26.50	98	29.89
19	19.41	79	23.00	39	26.56	99	29.94
1.3620	19.47	1.3680	23.06	1.3740	26.61	1.3800	30.00
21	19.53	81	23.13	41	26.67	01	30.06
22	19.59	82	23.19	42	26.72	02	30.11
23	19.65	83	23.25	43	26.78	03	30.17
24	19.71	84	23.31	44	26.83	04	30.22
25	19.76	85	23.38	45	26.89	05	30.28
26	19.82	86	23.44	46	26.94	06	30.33
27	19.88	87	23.50	47	27.00	07	30.39
28	19.94	88	23.56	48	27.06	08	30.44
29	20.00	89	23.63	49	27.12	09	30.50

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TABLE NO. 7—Continued.

DRY SUBSTANCE FROM REFRACTIVE INDEX AT 28° C.
(*Continued.*)

Index	Per Cent. Dry Substance.	Index.	Per cent. Dry Substance.	Index.	Per Cent. Dry Substance.	Index.	Per Cent. Dry Substance.
1.3810	30.56	1.3870	33.89	1.3930	37.16	1.3990	40.28
11	30.61	71	33.94	31	37.21	91	40.33
12	30.67	72	34.00	32	37.26	92	40.39
13	30.72	73	34.06	33	37.32	93	40.44
14	30.78	74	34.11	34	37.37	94	40.50
15	30.83	75	34.17	35	37.42	95	40.56
16	30.89	76	34.22	36	37.47	96	40 61
17	30.94	77	34.28	37	37.53	97	40.67
18	31.00	78	34.33	38	37.58	98	40.72
19	31.06	79	34.39	39	37.63	99	40.78
1.3820	31.11	1.3880	34.44	1.3940	37.68	1.4000	40.83
21	31.17	81	34.50	41	37.74	01	40.89
22	31.22	82	34.56	42	37.79	02	40.94
23	31.28	83	34.61	43	37.84	03	41.00
24	31.33	84	34.67	44	37.89	04	41.05
25	31.39	85	34.72	45	37.95	05	41.10
26	31.44	86	34.78	46	38.00	06	41.15
27	31.50	87	34.83	47	38.05	07	41.20
28	31.56	88	34.89	48	38.10	08	41.25
29	31.61	89	34.94	49	38.15	09	41.30
1.3830	31.67	1.3890	35.00	1.3950	38.20	1.4010	41.35
31	31.72	91	35.06	51	38.25	11	41.40
32	31.78	92	35.11	52	38.30	12	41.45
33	31.83	93	35.17	53	38.35	13	41.50
34	31.89	94	35.22	54	38.40	14	41.55
35	31.94	95	35.28	55	38.45	15	41.60
36	32.00	96	35.33	56	38.50	16	41.65
37	32.06	97	35.39	57	38.55	17	41.70
38	32.11	98	35.44	58	38.60	18	41.75
39	32.17	99	35.50	59	38.65	19	41.80
1.3840	32.22	1.3900	35.56	1.3960	38.70	1.4020	41.85
41	32.28	01	35.61	61	38.75	21	41.90
42	32.33	02	35.67	62	38.80	22	41.95
43	32.39	03	35.72	63	38.85	23	42.00
44	32.44	04	35.78	64	38.90	24	42.05
45	32.50	05	35.83	65	38.95	25	42.10
46	32.56	06	35.89	66	39.00		
47	32.61	07	35.94	67	39.05	27	42.20
48	32.67	08	36.00	68	39.11	28	42.25
49	32.72	09	36.05	69	39.16	29	42.30
1.3850	32.78	1.3910	36.11	1.3970	39.21	1.4030	42.35
51	32.83	11	36.16	71	39.26	31	42.40
52	32.89	12	36.21	72	39.32	32	42.45
53	32.94	13	36.26	73	39.37	33	42.50
54	33.00	14	36.32	74	39.42	34	42.55
55	33.06	15	36.37	75	39.47	35	42.60
56	33.11	16	36.42	76	39.53	36	42.65
57	33.17	17	36.47	77	39.58	37	42.70
58	33.22	18	36.53	78	39.63	38	42.75
59	33.28	19	36.58	79	39.68	39	42.80
1.3860	33.33	1.3920	36.63	1.3980	39.74	1.4040	42.85
61	33.39	21	36.68	81	39.79	41	42.90
62	33.44	22	36.74	82	39.84	42	42.95
63	33.50	23	36.79	83	39.89	43	43.00
64	33.56	24	36.84	84	39.95	44	43.05
65	33.61	25	36.89	85	40.00	45	43.10
66	33.67	26	36.95	86	40.06	46	43.15
67	33.72	27	37.00	87	40.11	47	43.20
68	33.78	28	37.05	88	40.17	48	43.25
69.	33.83	29	37.11	89	40.22	49	43.30

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TABLE NO. 7—Continued.

DRY SUBSTANCE FROM REFRACTIVE INDEX AT 28° C.
(*Continued.*)

Index	Per Cent Dry Substance.	Index.	Per cent. Dry Substance.	Index.	Per Cent. Dry Substance.	Index.	Per Cent. Dry Substance.
1.4050	43.35	1.4110	46.30	1.4170	49.19	1.4230	52.09
51	43.40	11	46.35	71	49.24	31	52.14
52	43.45	12	46.40	72	49.29	32	52.18
53	43.50	13	46.45	73	49.33	33	52.23
54	43.55	14	46.50	74	49.38	34	52.27
55	43.60	15	46.55	75	49.43	35	52.32
56	43.65	16	46.60	76	49.48	36	52.36
57	43.70	17	46.65	77	49.52	37	52.41
58	43.75	18	46.70	78	49.57	38	52.45
59	43.80	19	46.75	79	49.62	39	52.50
1.4060	43.85	1.4120	46.80	1.4180	49.67	1.4240	52.55
61	43.90	21	46.85	81	49.71	41	52.59
62	43.95	22	46.90	82	49.76	42	52.64
63	44.00	23	46.95	83	49.81	43	52.68
64	44.05	24	47.00	84	49.86	44	52.73
65	44.10	25	47.05	85	49.90	45	52.77
66	44.15	26	47.10	86	49.95	46	52.82
67	44.20	27	47.14	87	50.00	47	52.86
68	44.25	28	47.19	88	50.05	48	52.91
69	44.30	29	47.24	89	50.10	49	52.95
1.4070	44.35	1.4130	47.29	1.4190	50.14	1.4250	53.00
71	44.40	31	47.33	91	50.19	51	53.05
72	44.45	32	47.38	92	50.24	52	53.10
73	44.50	33	47.43	93	50.29	53	53.14
74	44.55	34	47.48	94	50.33	54	53.19
75	44.60	35	47.52	95	50.38	55	53.24
76	44.65	36	47.57	96	50.43	56	53.29
77	44.70	37	47.62	97	50.48	57	53.33
78	44.75	38	47.67	98	50.52	58	53.38
79	44.80	39	47.71	99	50.57	59	53.43
1.4080	44.85	1.4140	47.76	1.4200	50.62	1.4260	53.48
81	44.90	41	47.81	01	50.67	61	53.52
82	44.95	42	47.86	02	50.71	62	53.57
83	45.00	43	47.90	03	50.76	63	53.62
84	45.05	44	47.95	04	50.81	64	53.67
85	45.10	45	48.00	05	50.86	65	53.71
86	45.14	46	48.05	06	50.90	66	53.76
87	45.19	47	48.10	07	50.95	67	53.81
88	45.24	48	48.14	08	51.00	68	53.86
89	45.29	49	48.19	09	51.05	69	53.90
1.4090	45.33	1.4150	48.24	1.4210	51.10	1.4270	53.95
91	45.38	51	48.29	11	51.15	71	54.00
92	45.43	52	48.33	12	51.20	72	54.05
93	45.48	53	48.38	13	51.25	73	54.09
94	45.52	54	48.43	14	51.30	74	54.14
95	45.57	55	48.48	15	31.35	75	54.18
96	45.62	56	48.52	16	51.40	76	54.23
97	45.67	57	48.57	17	51.45	77	54.27
98	45.71	58	48.62	18	51.50	78	54.32
99	45.76	59	48.67	19	51.55	79	54.36
1.4100	45.81	1.4160	48.71	1.4220	51.60	1.4280	54.41
01	45.86	61	48.76	21	51.65	81	54.45
02	45.90	62	48.81	22	51.70	82	54.50
03	45.95	63	48.86	23	51.75	83	54.55
04	46.00	64	48.90	24	51.80	84	54.59
05	46.05	65	48.95	25	51.85	85	54.64
06	46.10	66	49.00	26	51.90	86	54.68
07	46.15	67	49.05	27	51.95	87	54.73
08	46.20	68	49.10	28	52.00	88	54.77
09	46.25	69	49.14	29	52.05	89	54.82

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TABLE NO. 7—Continued.

DRY SUBSTANCE FROM REFRACTIVE INDEX AT 28° C.
(*Continued.*)

Index	Per Cent. Dry Substance.	Index.	Per cent. Dry Substance.	Index.	Per Cent. Dry Substance.	Index.	Per Cent. Dry Substance.
1.4290	54.86	1.4350	57.59	1.4410	60.27	1.4470	62.95
91	54.91	51	57.64	11	60.32	71	63.00
92	54.95	52	57.68	12	60.36	72	63.04
93	55.00	53	57.73	13	60.41	73	63.09
94	55.05	54	57.77	14	60.45	74	63.13
95	55.09	55	57.82	15	60.50	75	63.17
96	55.14	56	57.86	16	60.55	76	63.22
97	55.18	57	57.91	17	60.59	77	63.26
98	55.23	58	57.95	18	60.64	78	63.30
99	55.27	59	58.00	19	60.68	78	63.35
1.4300	55.32	1.4360	58.04	1.4420	60.73	1.4480	63.39
01	55.36	61	58.09	21	60.77	81	63.43
02	55.41	62	58.13	22	66.82	82	63.48
03	55.45	63	58.17	23	60.86	83	63.52
04	55.50	64	58.22	24	60.91	84	63.57
05	55.55	65	58.26	25	60.95	85	63.61
06	55.59	66	58.30	26	61.00	86	63.65
07	55.64	67	58.35	27	61.04	87	63.70
08	55.68	68	58.39	28	61.09	88	63.74
09	55.73	69	58.43	29	61.13	89	63.78
1.4310	55.77	1.4370	58.48	1.4430	61.17	1.4490	63.83
11	55.82	71	58.52	31	61.22	91	63.87
12	55.86	72	58.57	32	61.26	92	63.91
13	55.91	73	58.61	33	61.30	93	63.96
14	55.95	74	58.65	34	61.35	94	64.00
15	56.00	75	58.70	35	61.39	95	64.04
16	56.05	76	58.74	36	61.43	96	64.09
17	56.09	77	58.78	37	61.48	97	64.13
18	56.14	78	58.83	38	61.52	98	64.17
19	56.18	79	58.87	39	61.57	99	64.22
1.4320	56.23	1.4380	58.91	1.4440	61.61	1.4500	64.26
21	56.27	81	58.96	41	61.65	01	64.30
22	56.32	82	59.00	42	61.70	02	64.35
23	56.36	83	59.05	43	61.74	03	64.39
24	56.41	84	59.09	44	61.78	04	64.43
25	56.45	85	59.14	45	61.83	05	64.48
26	56.50	86	59.18	46	61.87	06	64.52
27	56.55	87	59.23	47	61.91	07	64.57
28	56.59	88	59.27	48	61.96	08	64.61
29	56.64	89	59.32	49	62.00	09	64.65
1.4330	56.68	1.4390	59.36	1.4450	62.05	1.4510	64.70
31	56.73	91	59.41	51	62.09	11	64.74
32	56.77	92	59.45	52	62.14	12	64.78
33	56.82	93	59.50	53	62.18	13	64.83
34	56.86	94	59.55	54	62.23	14	64.87
35	56.91	95	59.59	55	62.27	15	64.91
36	56.95	96	59.64	56	62.32	16	64.96
37	57.00	97	59.68	57	62.36	17	65.00
38	57.05	98	59.73	58	62.41	18	65.04
39	57.09	99	59.77	59	62.45	19	65.09
1.4340	57.14	1.4400	59.82	1.4460	62.50	1.4520	65.13
41	57.18	01	59.86	61	62.55	21	65.17
42	57.23	02	58.91	62	62.59	22	65.22
42	57.27	03	59.95	63	62.64	23	65.26
44	57.32	04	60.00	64	62.68	24	65.30
45	57.36	05	60.05	65	62.73	25	65.35
46	57.41	06	60.09	66	62.77	26	65.39
47	57.45	07	60.14	67	62.82	27	65.43
48	57.50	08	60.18	68	62.86	28	65.48
49	57.55	09	60.23	69	62.91	29	65.52

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TABLE NO. 7—Continued.

DRY SUBSTANCE FROM REFRACTIVE INDEX AT 28° C.
(*Continued.*)

Index	Per Cent. Dry Substance.	Index.	Per cent. Dry Substance.	Index.	Per Cent. Dry Substance.	Index.	Per Cent. Dry Substance.
1.4530	65.57	1.4590	68.08	1.4650	70.58	1.4710	73.08
31	65.61	91	68.13	51	70.63	11	73.12
32	65.65	92	68.17	52	70.67	12	73.16
33	65.70	93	68.21	53	70.71	13	73.20
34	65.74	94	68.25	54	70.75	14	73.24
35	65.78	95	68.29	55	70.79	15	73.28
36	65.83	96	68.33	56	70.83	16	73.32
37	65.87	97	68.38	57	70.88	17	73.36
38	65.91	98	68.42	58	70.92	18	73.40
39	65.96	99	68.46	59	70.96	19	73.44
1.4540	66.00	1.4600	68.50	1.4660	71.00	1.4720	73.48
41	66.04	01	68.54	61	71.04	21	73.52
42	66.08	02	68.58	62	71.08	22	73.56
43	66.13	03	68.63	63	71.13	23	73.60
44	66.17	04	68.67	64	71.17	24	73.64
45	66.21	05	68.71	65	71.21	25	73.68
46	66.25	06	68.75	66	71.25	26	73.72
47	66.29	07	68.79	67	71.29	27	73.76
48	66.33	08	68.83	68	71.33	28	73.80
49	66.38	09	68.88	69	71.38	29	73.84
1.4550	66.42	1.4610	68.92	1.4670	71.42	1.4730	73.88
51	66.46	11	68.96	71	71.46	31	73.92
52	66.50	12	69.00	72	71.50	32	73.96
53	66.54	13	69.04	73	71.54	33	74.00
54	66.58	14	69.08	74	71.58	34	74.04
55	66.63	15	69.13	75	71.63	55	74.08
56	66.67	16	69.17	76	71.67	36	74.12
57	66.71	17	69.21	77	71.71	37	74.16
58	66.75	18	69.25	78	71.75	38	74.20
59	66.79	19	69.29	79	71.79	39	74.24
1.4560	66.83	1.4620	69.33	1.4680	71.83	1.4740	74.28
61	66.88	21	69.38	81	71.88	41	74.32
62	66.92	22	69.42	82	71.92	42	74.36
63	66.96	23	69.46	83	71.96	43	74.40
64	67.00	24	69.50	84	72.00	44	74.44
65	67.04	25	69.54	85	72.04	45	74.48
66	67.08	26	69.58	86	72.08	46	74.52
67	67.13	27	69.63	87	72.13	47	74.56
68	67.17	28	69.67	88	72.17	48	74.60
69	67.21	29	69.71	89	72.21	49	74.64
1.4570	67.25	1.4630	69.75	1.4690	72.25	1.4750	74.68
71	67.29	31	69.79	91	72.29	51	74.72
72	67.33	32	69.83	92	72.33	52	74.76
73	67.38	33	69.88	93	72.38	53	74.80
74	67.42	34	69.92	94	72.42	54	74.84
75	67.46	35	69.96	95	72.46	55	74.88
76	67.50	36	70.00	96	72.50	56	74.92
77	67.54	37	70.04	97	72.54	57	74.96
78	67.58	38	70.08	98	72.58	58	75.00
79	67.63	39	70.13	99	72.63	59	75.04
1.4580	67.67	1.4640	70.17	1.4700	72.67	1.4760	75.08
81	67.71	41	70.21	01	72.71	61	75.12
82	67.75	42	70.25	02	72.75	62	75.16
83	67.79	43	70.29	03	72.79	63	75.20
84	67.83	44	70.33	04	72.83	64	75.24
85	67.88	45	70.38	05	72.88	65	75.28
86	67.92	46	70.42	06	72.92	66	75.32
87	67.96	47	70.46	07	72.96	67	75.36
88	68.00	48	70.50	08	73.00	68	75.40
89	68.04	49	70.54	09	73.04	69	75.44

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TABLE NO. 7—Continued.

DRY SUBSTANCE FROM REFRACTIVE INDEX AT 28° C.

(*Continued.*)

Index	Per Cent. Dry Substance.	Index.	Per cent. Dry Substance.	Index.	Per Cent. Dry Substance.	Index.	Per Cent. Dry Substance.
1.4770	75.48	1.4830	77.88	1.4890	80.19	1.4950	82.50
71	75.52	31	77.92	91	80.23	51	82.54
72	75.56	32	77.96	92	80.27	52	82.58
73	75.60	33	78.00	93	80.31	53	82.62
74	75.64	34	78.04	94	80.35	54	82.65
75	75.68	35	78.08	95	80.38	55	82.69
76	75.72	36	78.12	96	80.42	56	82.73
77	75.76	37	78.15	97	80.46	57	82.77
78	75.80	38	78.19	98	80.50	58	82.81
79	75.84	39	78.23	99	80.54	59	82.85
1.4780	75.88	1.4840	78.28	1.4900	80.58	1.4960	82.88
81	75.92	41	78.31	01	80.62	61	82.92
82	75.96	42	78.35	02	80.65	62	82.96
83	76.00	43	78.38	03	80.69	63	83.00
84	76.04	44	78.42	04	80.73	64	83.04
85	76.08	45	78.46	05	80.77	65	83.08
86	76.12	46	78.50	06	80.81	66	83.12
87	76.16	47	78.54	07	80.85	67	83.15
88	76.20	48	78.58	08	80.88	68	83.19
89	76.24	49	78.62	09	80.92	69	83.23
1.4790	76.28	1.4850	78.65	1.4910	80.96	1.4970	83.27
91	76.32	51	78.69	11	81.00	71	83.31
92	76.36	52	78.73	12	81.04	72	83.35
93	76.40	53	78.77	13	81.08	73	83.38
94	76.44	54	78.81	14	81.12	74	83.42
95	76.48	55	78.85	15	81.15	75	83.46
96	76.52	56	78.88	16	81.19	76	83.50
97	76.56	57	78.92	17	81.23	77	83.54
98	76.60	58	78.96	18	81.27	78	83.58
99	76.64	59	79.00	19	81.31	79	83.62
1.4800	76.68	1.4860	79.04	1.4920	81.35	1.4980	83.65
01	76.72	61	79.08	21	81.38	81	83.69
02	76.76	62	79.12	22	81.42	82	83.73
03	76.80	63	79.15	23	81.46	83	83.77
04	76.84	64	79.19	24	81.50	84	83.81
05	76.88	65	79.23	25	81.54	85	83.85
06	76.92	66	79.27	26	81.58	86	83.88
07	76.96	67	79.31	27	81.62	87	83.92
08	77.00	68	79.35	28	81.65	88	83.96
09	77.04	69	79.38	29	81.69	89	84.00
1.4810	77.08	1.4870	79.42	1.4930	81.73	1.4990	84.04
11	77.12	71	79.46	31	81.77	91	84.08
12	77.16	72	79.50	32	81.81	92	84.12
13	77.20	73	79.54	33	81.85	93	84.15
14	77.24	74	79.59	34	81.88	94	84.19
15	77.28	75	79.62	35	81.92	95	84.23
16	77.32	76	79.65	36	81.96	96	84.27
17	77.36	77	79.69	37	82.00	97	84.31
18	77.40	78	79.73	38	82.04	98	84.35
19	77.44	79	79.77	39	82.08	99	84.38
1.4820	77.48	1.4880	79.81	1.4940	82.12	1.5000	84.42
21	77.52	81	79.85	41	82.15	01	84.46
22	77.56	82	79.88	42	82.19	02	84.50
23	77.60	83	79.92	43	82.23	03	84.54
24	77.64	84	79.96	44	82.27	04	84.58
25	77.68	85	80.00	45	82.31	05	84.62
26	77.72	86	80.04	46	82.35	06	84.65
27	77.76	87	80.08	47	82.38	07	84.69
28	77.80	88	80.12	48	82.42	08	84.73
29	77.84	89	80.15	49	82.46	09	84.77

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TABLE NO. 7—Continued.

DRY SUBSTANCE FROM REFRACTIVE INDEX AT 28° C.

(Continued.)

Index	Per Cent. Dry Substance.	Index.	Per cent. Dry Substance.	Index.	Per Cent. Dry Substance.
1.5010	84.81	1.5070	87.04	1.5130	89.25
11	84.85	71	87.07	31	89.29
12	84.88	72	87.11	32	89.32
13	84.92	73	87.15	33	89.36
14	84.96	74	87.19	34	89.39
15	85.00	75	87.22	35	89.43
16	85.04	76	87.26	36	89.46
17	85.07	77	87.30	37	89.50
18	85.11	78	87.33	38	89.54
19	85.15	79	87.37	39	89.57
1.5020	85.19	1.5080	87.41	1.5140	89.61
21	85.22	81	87.44	41	89.64
22	85.26	82	87.48	42	89.68
23	85.30	83	87.52	43	89.71
24	85.33	84	87.56	44	89.75
25	85.37	85	87.59	45	89.79
26	85.41	86	87.63	46	89.82
27	85.44	87	87.67	47	89.86
28	85.48	88	87.70	48	89.89
29	85.52	89	87.74	49	89.93
1.5030	85.56	1.5090	87.78	1.5150	89.96
31	85.59	91	87.81	51	90.00
32	85.63	92	87.85	52	90.04
33	85.67	93	87.88	53	90.07
34	85.70	94	87.93	54	90.11
35	85.74	95	87.96	55	90.14
36	85.78	96	88.00	56	90.18
37	85.81	97	88.04	57	90.21
38	85.85	98	88.07	58	90.25
39	85.89	99	88.11	59	90.29
1.5040	85.93	1.5100	88.15	1.5160	90.32
41	85.96	01	88.19	61	90.36
42	86.00	02	88.22	62	90.39
43	86.04	03	88.26	63	90.43
44	86.07	04	88.30	64	90.46
45	86.11	05	88.33	65	90.50
46	86.15	06	88.37	66	90.54
47	86.19	07	88.41	67	90.57
48	86.22	08	88.44	68	90.61
49	86.26	09	88.48	69	90.64
1.5050	86.30	1.5110	88.52	1.5170	90.68
51	86.33	11	88.56	71	90.71
52	86.37	12	88.59	72	90.75
53	86.41	13	88.63	73	90.79
54	86.44	14	88.67	74	90.82
55	86.48	15	88.70	75	90.86
56	86.52	16	88.74	76	90.89
57	86.56	17	88.78	77	90.93
58	86.59	18	88.81	78	90.96
59	86.63	19	88.85	79	91.00
1.5060	86.67	1.5120	88.89	1.5180	91.04
61	86.70	21	88.93	81	91.07
62	86.74	22	88.96	82	91.11
63	86.78	23	89.00		
64	86.81	24	89.04		
65	86.85	25	89.07		
66	86.89	26	89.11		
67	86.93	27	89.14		
68	86.96	28	89.18		
69	87.00	29	89.21		

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TABLE NO. 7—Concluded.

TABLE OF CORRECTIONS FOR THE TEMPERATURE.

Dry Substance.

Temperature of the Prisms in ° C.	0	5	10	15	20	25	30	40	50	60	70	80	90
						Subtract.							
20	.53	.54	.55	.56	.57	.58	.60	.62	.64	.62	.61	.60	.58
21	.46	.47	.48	.49	.50	.51	.52	.54	.56	.54	.53	.52	.50
22	.40	.41	.42	.42	.43	.44	.45	.47	.48	.47	.46	.45	.44
23	.33	.33	.34	.35	.36	.37	.38	.39	.40	.39	.38	.38	.38
24	.26	.26	.27	.28	.28	.29	.30	.31	.32	.31	.31	.30	.30
25	.20	.20	.21	.21	.22	.22	.23	.23	.24	.23	.23	.23	.22
26	.12	.12	.13	.14	.14	.14	.15	.15	.16	.16	.16	.15	.14
27	.07	.07	.07	.07	.07	.07	.08	.08	.08	.08	.08	.08	.07
						Add.							
29	.07	.07	.07	.07	.07	.07	.08	.08	.08	.08	.08	.08	.07
30	.12	.12	.13	.14	.14	.14	.15	.15	.16	.16	.16	.15	.14
31	.20	.20	.21	.21	.22	.22	.23	.23	.24	.23	.23	.23	.22
32	.26	.26	.27	.28	.28	.29	.30	.31	.32	.31	.31	.30	.30
33	.33	.33	.34	.35	.36	.37	.38	.39	.40	.39	.38	.38	.38
34	.40	.41	.42	.42	.43	.44	.45	.47	.48	.47	.46	.45	.44
35	.46	.47	.48	.49	.50	.51	.52	.54	.56	.54	.53	.52	.50

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TABLE NO. 8.

WEIGHT OF CONDENSER WATER CORRESPONDING TO A UNIT WEIGHT OF WATER EVAPORATED FROM JUICE.

(For Single Effects, *i. e.*, Vacuum Pans.)

Temp. of water going into condenser in ° C.	Temperature of Water Coming Out of Condensers in ° C.															
	30.	32.	34.	36.	38.	40.	42.	44.	46.	48.	50.	52.	54.	56.	58.	60.
5	24.7	22.8	21.3	19.9	18.7	17.6	16.7	15.8	15.0	14.3	13.7	13.1	12.6	12.1	11.6	11.2
6	25.6	23.7	22.0	20.0	19.2	18.1	17.1	16.2	15.4	14.7	14.0	13.4	12.8	12.3	11.8	11.4
7	26.7	24.6	22.8	21.2	19.8	18.6	17.6	16.6	15.8	15.0	14.3	13.7	13.1	12.5	12.0	11.6
8	27.9	25.6	23.6	21.9	20.4	19.2	18.0	17.0	16.1	15.3	14.6	13.9	13.3	12.8	12.3	11.8
9	29.2	26.8	24.5	22.7	21.1	19.8	18.6	17.5	16.6	15.7	14.9	14.2	13.6	13.0	12.5	12.0
10	30.6	27.8	25.5	23.5	21.8	20.4	19.1	18.0	17.0	16.1	15.3	14.6	13.9	13.3	12.7	12.2
11	32.1	29.1	26.5	24.4	22.6	21.0	19.7	18.5	17.4	16.5	15.7	14.9	14.2	13.6	13.0	12.5
12	33.9	30.5	27.7	25.4	23.4	21.8	20.3	19.0	17.9	16.9	16.0	15.2	14.5	13.9	13.3	12.7
13	35.8	32.0	29.0	26.5	24.3	22.5	21.0	19.6	18.4	17.4	16.4	15.6	14.8	14.2	13.5	12.9
14	38.0	33.7	30.4	27.6	25.3	23.4	21.7	20.2	19.0	17.9	16.9	16.0	15.2	14.5	13.8	13.2
15	40.4	35.7	31.9	28.9	26.4	24.2	22.5	20.9	19.6	18.4	17.3	16.4	15.6	14.8	14.1	13.5
16	43.2	37.8	33.6	30.3	27.5	25.2	23.3	21.6	20.2	18.9	17.8	16.8	15.9	15.1	14.4	13.8
17	46.5	40.3	35.6	31.8	28.8	26.3	24.2	22.4	20.8	19.5	18.3	17.3	16.3	15.5	14.7	14.1
18	50.3	43.1	37.8	33.5	30.2	27.4	25.1	23.2	21.6	20.1	18.9	17.7	16.8	15.9	15.1	14.4
19	54.8	46.3	40.2	35.4	31.7	28.7	26.2	24.1	22.3	20.8	19.4	18.3	17.2	16.3	15.4	14.7
20	60.1	50.1	43.0	37.6	33.4	30.1	27.3	25.1	23.1	21.5	20.0	18.8	17.7	16.7	15.8	15.0
21	66.7	54.6	46.2	40.0	35.3	31.6	28.6	26.1	24.0	22.2	20.7	19.3	18.2	17.2	16.2	15.4
22	74.9	59.9	49.9	42.8	37.5	33.3	30.0	27.2	25.0	23.1	21.4	20.0	18.7	17.6	16.7	15.8
23	85.5	66.5	54.4	46.0	39.9	35.2	31.5	28.5	26.0	23.9	22.2	20.6	19.3	18.1	17.1	16.2
24	99.6	74.7	59.7	49.8	42.7	37.3	33.2	29.9	27.2	24.9	23.0	21.3	19.9	18.7	17.6	16.6
25	119.3	85.2	66.3	53.2	45.9	39.8	35.1	31.4	28.4	25.9	23.9	22.1	20.6	19.2	18.1	17.0
26	....	98.2	74.4	59.5	49.6	42.5	37.2	33.1	29.8	27.1	24.8	22.9	21.3	19.8	18.6	17.5
27	....	118.9	84.9	65.8	54.0	45.7	39.6	35.0	31.3	28.3	25.8	23.8	22.0	20.5	19.2	18.0
28	....	....	98.9	74.2	59.3	49.4	42.4	37.1	33.0	29.7	27.0	24.7	22.8	21.2	19.8	18.5
29	....	....	118.5	84.6	65.6	53.9	45.6	39.5	34.8	31.2	28.2	25.8	23.7	21.9	20.4	19.1
30	....	....	....	98.6	73.9	59.1	49.3	42.2	37.0	32.9	29.6	26.9	24.6	22.7	21.1	19.7
31	....	....	....	118.1	84.3	65.6	53.7	45.4	39.4	34.7	31.1	28.1	25.7	23.6	21.9	20.4
32	....	....	....	....	98.2	73.7	58.9	49.1	42.1	36.8	32.7	29.5	26.8	24.6	22.7	21.0
33	....	....	....	....	117.7	84.0	65.4	53.5	45.3	39.2	34.6	31.0	28.0	25.6	23.5	21.8
34	....	....	....	....	....	97.9	73.4	58.7	48.9	42.0	36.7	32.6	29.4	26.7	24.5	22.6
35	....	....	....	....	....	117.3	83.8	65.1	53.3	45.1	39.1	34.5	30.9	27.9	25.5	23.5
36	....	....	....	....	....	....	97.6	73.2	58.5	48.8	41.8	36.6	32.5	29.3	26.6	24.4
37	....	....	....	....	....	....	116.9	83.5	64.9	53.1	44.9	39.0	34.4	30.8	27.8	25.4
38	....	....	....	....	....	....	....	97.2	72.9	58.3	48.6	41.7	36.5	32.4	29.2	26.5
39	....	....	....	....	....	....	....	116.5	83.2	64.7	52.9	44.8	38.8	34.3	30.6	27.7
40	....	....	....	....	....	....	....	....	96.9	72.7	58.1	48.4	41.5	36.3	32.3	29.1

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TABLE NO. 9.

GLUCOSE (INVERT SUGAR CORRESPONDING TO CUPRIC OXID AND TO COPPER.

Cupric Oxide	Copper	Glucose			Cupric Oxide	Copper	Glucose		
		1*	2	3			1	2	3
11.1	8.9	4.5	1.6	....	61.1	48.9	24.6	22.0	15.7
12.2	9.8	5.0	2.1	....	62.3	49.7	25.0	22.5	16.2
13.3	10.7	5.4	2.5	....	63.4	50.6	25.5	22.9	16.6
14.5	11.5	5.8	3.0	....	64.5	51.5	25.9	23.4	17.1
15.6	12.4	6.3	3.4	....	65.6	52.4	26.4	23.9	17.5
16.7	13.3	6.7	3.9	....	66.7	53.3	26.8	24.3	18.0
17.8	14.2	7.2	4.3	....	67.8	54.2	27.3	24.8	18.5
18.9	15.1	7.6	4.8	....	68.9	55.1	27.7	25.2	18.9
20.0	16.0	8.1	5.2	....	70.0	56.0	28.2	25.7	19.4
21.1	16.9	8.5	5.7	....	71.2	56.8	28.6	26.2	19.8
22.2	17.8	8.9	6.1	....	72.3	57.7	29.1	26.6	20.3
23.3	18.7	9.4	6.6	....	73.4	58.6	29.5	27.1	20.8
24.5	19.5	9.8	7.0	....	74.5	59.5	30.0	27.5	21.2
25.6	20.4	10.3	7.5	....	75.6	60.4	30.4	28.0	21.7
26.7	21.3	10.7	7.9	....	76.7	61.3	30.9	28.5	22.2
27.8	22.2	11.2	8.4	....	77.8	62.2	31.3	28.9	22.6
28.9	23.1	11.6	8.8	....	78.9	63.1	31.8	29.4	23.1
30.0	24.0	12.0	9.3	....	80.0	64.0	32.3	29.8	23.5
31.1	24.9	12.5	9.7	....	81.2	64.8	32.7	30.3	24.0
32.2	25.8	12.9	10.2	....	82.3	65.7	33.2	30.8	24.5
33.4	26.6	13.4	10.7	4.3	83.4	66.6	33.6	31.2	24.9
34.5	27.5	13.8	11.1	4.7	84.5	67.5	34.1	31.7	25.4
35.6	28.4	14.3	11.6	5.2	85.6	68.4	34.5	32.1	25.9
36.7	29.3	14.7	12.0	5.6	86.7	69.3	35.0	32.6	26.3
37.8	30.2	15.2	12.5	6.1	87.8	70.2	35.4	33.1	26.8
38.9	31.1	15.6	12.9	6.5	88.9	71.1	35.9	33.5	27.3
40.0	32.0	16.1	13.4	7.0	90.1	71.9	36.3	34.0	27.7
41.1	32.9	16.5	13.8	7.4	91.2	72.8	36.8	34.5	28.2
42.2	33.8	16.9	14.3	7.9	92.3	73.7	37.3	34.9	28.6
43.4	34.6	17.4	14.7	8.4	93.4	74.6	37.7	35.4	29.1
44.5	35.5	17.8	15.2	8.8	94.5	75.5	38.2	35.8	29.6
45.6	36.4	18.3	15.6	9.3	95.6	76.4	38.6	36.3	30.0
46.7	37.3	18.7	16.1	9.7	96.7	77.3	39.1	36.8	30.5
47.8	38.2	19.2	16.6	10.2	97.8	78.2	39.5	37.2	31.0
48.9	39.1	19.6	17.0	10.7	98.9	79.1	40.0	37.7	31.4
50.0	40.0	20.1	17.5	11.1	100.1	79.9	40.4	38.2	31.9
51.1	40.9	20.5	17.9	11.6	101.2	80.8	40.9	38.6	32.4
52.3	41.7	21.0	18.4	12.0	102.3	81.7	41.4	39.1	32.8
53.4	42.6	21.4	18.8	12.5	103.4	82.6	41.8	39.6	33.3
54.5	43.5	21.9	19.3	12.9	104.5	83.5	42.3	40.0	33.8
55.6	44.4	22.3	19.7	13.4	105.6	84.4	42.7	40.5	34.2
56.7	45.3	22.8	20.2	13.9	106.7	85.3	43.2	41.0	34.7
57.8	46.2	23.2	20.7	14.3	107.8	86.2	43.7	41.4	35.2
58.9	47.1	23.7	21.1	14.8	109.0	87.1	44.1	41.9	35.6
60.0	48.0	24.1	21.6	15.2	110.1	87.9	44.6	42.4	36.1

* 1=No sucrose present, 2=0.8 grams total in 100 c. c., 3=4.0 grams total sugar 100 c. c.

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TABLE NO. 9—Continued.

GLUCOSE (INVERT SUGAR CORRESPONDING TO CUPRIC OXID AND TO COPPER.—*Continued.*

Cupric Oxide	Copper	Glucose			Cupric Oxide	Copper	Glucose		
		1	2	3			1	2	3
111.2	88.8	45.0	42.8	36.6	166.8	133.2	68.3	66.4	60.2
112.3	89.7	45.5	43.3	37.0	167.9	134.1	68.7	66.9	60.7
113.4	90.6	46.0	43.8	37.5	169.0	135.0	69.2	67.3	61.2
114.5	91.5	46.4	44.2	38.0	170.1	135.9	69.7	67.8	61.7
115.6	92.4	46.9	44.7	38.5	171.2	136.8	70.1	68.3	62.1
116.7	93.3	47.3	45.2	38.9	172.3	137.7	70.6	68.8	62.6
117.8	94.2	47.8	45.6	39.4	173.4	138.6	71.1	69.2	63.1
119.0	95.0	48.3	46.1	39.9	174.5	139.5	71.6	69.7	63.6
120.1	95.9	48.7	46.6	40.3	175.7	140.3	72.0	70.2	64.1
121.2	96.8	49.2	47.0	40.8	176.8	141.2	72.5	70.7	64.5
122.3	97.7	49.6	47.5	41.3	177.9	142.1	73.0	71.2	65.0
123.4	98.6	50.1	48.0	41.7	179.0	143.0	73.4	71.6	65.5
124.5	99.5	50.6	48.4	42.2	180.1	143.9	73.9	72.1	66.0
125.6	100.4	51.0	48.9	42.7	181.2	144.8	74.4	72.6	66.5
126.7	101.3	51.5	49.4	43.2	182.3	145.7	74.9	73.1	66.9
127.9	102.2	51.9	49.8	43.6	183.4	146.6	75.3	73.6	67.4
129.0	103.0	52.4	50.3	44.1	184.6	147.5	75.8	74.0	67.9
130.1	103.9	52.9	50.8	44.6	185.7	148.3	76.3	74.5	68.4
131.2	104.8	53.3	51.2	45.0	186.8	149.2	76.8	75.0	68.9
132.3	105.7	53.8	51.7	45.5	187.9	150.1	77.2	75.5	69.3
133.4	106.6	54.3	52.2	46.0	189.0	151.0	77.7	76.0	69.8
134.5	107.5	54.7	52.7	46.5	190.1	151.9	78.2	76.4	70.3
135.6	108.4	55.2	53.1	46.9	191.2	152.8	78.7	76.9	70.8
136.7	109.3	55.7	53.6	47.4	192.3	153.7	79.1	77.4	71.3
137.9	110.1	56.1	54.1	47.9	193.4	154.6	79.6	77.9	71.7
139.0	111.0	56.6	54.5	48.3	194.6	155.5	80.1	78.4	72.2
140.1	111.9	57.0	55.0	48.8	195.7	156.3	80.6	78.8	72.7
141.2	112.8	57.5	55.5	49.3	196.8	157.2	81.0	79.3	73.2
142.3	113.7	58.0	55.9	49.8	197.9	158.1	81.5	79.8	73.7
143.4	114.6	58.4	56.4	50.2	199.0	159.0	82.0	80.3	74.2
144.5	115.5	58.9	56.9	50.7	200.1	159.9	82.5	80.8	74.6
145.6	116.4	59.4	57.4	51.2	201.2	160.8	82.9	81.3	75.1
146.8	117.3	59.8	57.8	51.7	202.3	161.7	83.4	81.7	75.6
147.9	118.1	60.3	58.3	52.1	203.5	162.6	83.9	82.2	76.1
149.0	119.0	60.8	58.8	52.6	204.6	163.4	84.4	82.7	76.6
150.1	119.9	61.2	59.3	53.1	205.7	164.3	84.9	83.2	77.1
151.2	120.8	61.7	59.7	53.6	206.8	165.2	85.3	83.7	77.6
152.3	121.7	62.2	60.2	54.0	207.9	166.1	85.8	84.2	78.0
153.4	122.6	62.6	60.7	54.5	209.0	167.0	86.3	84.6	78.5
154.5	123.5	63.1	61.2	55.0	210.1	167.9	86.8	85.1	79.0
155.6	124.4	63.6	61.6	55.5	211.2	168.8	87.2	85.6	79.5
156.8	125.2	64.0	62.1	55.9	212.3	169.7	87.7	86.1	80.0
157.9	126.1	64.5	62.6	56.4	213.5	170.5	88.2	86.6	80.5
159.0	127.0	65.0	63.1	56.9	214.6	171.4	88.7	87.1	81.0
160.1	127.9	65.4	63.5	57.4	215.7	172.3	89.2	87.6	81.4
161.2	128.8	65.9	64.0	57.8	216.8	173.2	89.6	88.0	81.9
162.3	129.7	66.4	64.5	58.3	217.9	174.1	90.1	88.5	82.4
163.4	130.6	66.9	65.0	58.8	219.0	175.0	90.6	89.0	82.9
164.5	131.5	67.3	65.4	59.3	220.1	175.9	91.1	89.5	83.4
165.7	132.4	67.8	65.9	59.7	221.2	176.8	91.6	90.0	83.9

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TABLE NO. 9—Continued.

GLUCOSE (INVERT SUGAR CORRESPONDING TO CUPRIC OXID AND TO COPPER.—*Continued.*

Cupric Oxide	Copper	Glucose			Cupric Oxide	Copper	Glucose		
		1	2	3			1	2	3
222.4	177.7	92.0	90.5	84.4	277.9	222.1	116.4	115.1	109.0
223.5	178.5	92.5	91.0	84.8	279.1	223.0	116.9	115.6	109.5
224.6	179.4	93.0	91.4	85.3	280.2	223.8	117.4	116.1	110.0
225.7	180.3	93.5	91.9	85.8	281.3	224.7	117.9	116.6	110.5
226.8	181.2	94.0	92.4	86.3	282.4	225.6	118.4	117.1	111.0
227.9	182.1	94.5	92.9	86.8	283.5	226.5	118.9	117.6	111.5
229.0	183.0	94.9	93.4	87.3	284.6	227.4	119.4	118.1	112.0
230.1	183.9	95.4	93.9	87.8	285.7	228.3	119.9	118.6	112.5
231.3	184.8	95.9	94.4	88.3	286.8	229.2	120.4	119.1	113.0
232.4	185.6	96.4	94.9	88.8	288.0	230.1	120.9	119.6	113.5
233.5	186.5	96.9	95.4	89.2	289.1	231.0	121.4	120.1	114.0
234.6	187.4	97.4	95.8	89.7	290.2	231.8	121.9	120.6	114.5
235.7	188.3	97.8	96.3	90.2	291.3	232.7	122.4	121.1	115.0
236.8	189.2	98.3	96.8	90.7	292.4	233.6	122.9	121.6	115.5
237.9	190.1	98.8	97.3	91.2	293.5	234.5	123.4	122.1	116.0
239.0	191.0	99.3	97.8	91.7	294.6	235.4	123.9	122.6	116.5
240.1	191.9	99.8	98.3	92.2	295.7	236.3	124.4	123.1	117.0
241.3	192.8	100.3	98.8	92.7	296.8	237.2	124.9	123.6	117.5
242.4	193.6	100.8	99.3	93.2	298.0	238.1	125.4	124.1	118.0
243.5	194.5	101.2	99.8	93.7	299.1	238.9	125.9	124.6	118.5
244.6	195.4	101.7	100.3	94.2	300.2	239.8	126.4	125.1	119.0
245.7	196.3	102.2	100.8	94.7	301.3	240.7	126.9	125.6	119.5
246.8	197.2	102.7	101.2	95.1	302.4	241.6	127.4	126.2	120.0
247.9	198.1	103.2	101.7	95.6	303.5	242.5	127.9	126.7	120.6
249.0	199.0	103.7	102.2	96.1	304.6	243.4	128.4	127.2	121.1
250.2	199.9	104.2	102.7	96.6	305.7	244.3	128.9	127.7	121.6
251.3	200.7	104.6	103.2	97.1	306.9	245.2	129.4	128.2	122.1
252.4	201.6	105.1	103.7	97.6	308.0	246.1	129.9	128.7	122.6
253.5	202.5	105.6	104.2	98.1	309.1	246.9	130.4	129.2	123.1
254.6	203.4	106.1	104.7	98.6	310.2	247.8	130.9	129.7	123.6
255.7	204.3	106.6	105.2	99.1	311.3	248.7	131.4	130.2	124.1
256.8	205.2	107.1	105.7	99.6	312.4	249.6	131.9	130.7	124.6
257.9	206.1	107.6	106.2	100.1	313.5	250.5	132.4	131.2	125.1
259.0	207.0	108.1	106.7	100.6	314.6	251.4	132.9	131.7	125.6
260.2	207.9	108.6	107.2	101.1	315.7	252.3	133.4	132.2	126.1
261.3	208.7	109.1	107.7	101.6	316.9	253.2	133.9	132.7	126.6
262.4	209.6	109.5	108.2	102.1	318.0	254.0	134.4	133.2	127.1
263.5	210.5	110.0	108.7	102.6	319.1	254.9	134.9	133.7	127.6
264.6	211.4	110.5	109.2	103.1	320.2	255.8	135.4	134.3	128.1
265.7	212.3	111.0	109.6	103.5	321.3	256.7	135.9	134.8	128.6
266.8	213.2	111.5	110.1	104.0	322.4	257.6	136.4	135.3	129.2
267.9	214.1	112.0	110.6	104.5	323.5	258.5	136.9	135.8	129.7
269.1	215.0	112.5	111.1	105.0	324.6	259.4	137.4	136.3	130.2
270.2	215.8	113.0	111.6	105.5	325.8	260.3	137.9	136.8	130.7
271.3	216.7	113.5	112.1	106.0	326.9	261.2	138.4	137.3	131.2
272.4	217.6	114.0	112.6	106.5	328.0	262.0	138.9	137.8	131.7
273.5	218.5	114.5	113.1	107.0	329.1	262.9	139.4	138.3	132.2
274.6	219.4	115.0	113.6	107.5	330.2	263.8	140.0	138.8	132.7
275.7	220.3	115.4	114.1	108.0	331.3	264.7	140.5	139.4	133.2
276.8	221.2	115.9	114.6	108.5	332.4	265.6	141.0	139.9	133.7

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TABLE NO. 9—Continued.

GLUCOSE (INVERT SUGAR CORRESPONDING TO CUPRIC OXID AND TO COPPER.—*Continued.*

Cupric Oxide	Copper	Glucose			Cupric Oxide	Copper	Glucose		
		1	2	3			1	2	3
333.5	266.5	141.5	140.4	134.2	389.1	310.9	167.2	166.3	160.1
334.6	267.4	142.0	140.9	134.8	390.2	311.8	167.7	166.8	160.6
335.8	268.3	142.5	141.4	135.3	391.3	312.7	168.3	167.3	161.1
336.9	269.1	143.0	141.9	135.8	392.5	313.6	168.8	167.8	161.6
338.0	270.0	143.5	142.4	136.3	393.6	314.4	169.3	168.4	162.2
339.1	270.9	144.0	142.9	136.8	394.7	315.3	169.8	168.9	162.7
340.2	271.8	144.5	143.4	137.3	395.8	316.2	170.4	169.4	163.2
341.3	272.7	145.0	144.0	137.8	396.9	317.1	170.9	170.0	163.7
342.4	273.6	145.5	144.5	138.3	398.0	318.0	171.4	170.5	164.3
343.5	274.5	146.1	145.0	138.8	399.1	318.9	171.9	171.0	164.8
344.7	275.4	146.6	145.5	139.4	400.2	319.8	172.5	171.5	165.3
345.8	276.3	147.1	146.0	139.9	401.4	320.7	173.0	172.1	165.8
346.9	277.1	147.6	146.5	140.4	402.5	321.6	173.5	172.6	166.4
348.0	278.0	148.1	147.0	140.9	403.6	322.4	174.0	173.1	166.9
349.1	278.9	148.6	147.6	141.4	404.7	323.3	174.6	173.7	167.4
350.2	279.8	149.1	148.1	141.9	405.8	324.2	175.1	174.2	167.9
351.3	280.7	149.6	148.6	142.4	406.9	325.1	175.6	174.7	168.5
352.4	281.6	150.1	149.1	143.0	408.0	326.0	176.1	175.2	169.0
353.5	282.5	150.7	149.6	143.5	409.1	326.9	176.7	175.8	169.5
354.7	283.4	151.2	150.1	144.0	410.2	327.8	177.2	176.3	170.0
355.8	284.2	151.7	150.7	144.5	411.4	328.7	177.7	176.8	170.6
356.9	285.1	152.2	151.2	145.0	412.5	329.5	178.3	177.4	171.1
358.0	286.0	152.7	151.7	145.5	413.6	330.4	178.8	177.9	171.6
359.1	286.9	153.2	152.2	146.0	414.7	331.3	179.3	178.4	172.2
360.2	287.8	153.7	152.7	146.6	415.8	332.2	179.8	179.0	172.7
361.3	288.7	154.3	153.2	147.1	416.9	333.1	180.4	179.5	173.2
362.4	289.6	154.8	153.8	147.6	418.0	334.0	180.9	180.0	173.7
363.6	290.5	155.3	154.3	148.1	419.1	334.9	181.4	180.6	174.3
364.7	291.4	155.8	154.8	148.6	420.3	335.8	182.0	181.1	174.8
365.8	292.2	156.3	155.3	149.1	421.4	336.7	182.5	181.6	175.3
366.9	293.1	156.8	155.8	149.7	422.5	337.5	183.0	182.1	175.9
368.0	294.0	157.3	156.4	150.2	423.6	338.4	183.6	182.7	176.4
369.1	294.9	157.9	156.9	150.7	424.7	339.3	184.1	183.2	176.9
370.2	295.8	158.4	157.4	151.2	425.8	340.2	184.6	183.8	177.5
371.3	296.7	158.9	157.9	151.7	426.9	341.1	185.2	184.3	178.0
372.4	297.6	159.4	158.4	152.3	428.0	342.0	185.7	184.8	178.5
373.6	298.5	159.9	159.0	152.8	429.1	342.9	186.2	185.4	179.1
374.7	299.3	160.5	159.5	153.3	430.3	343.8	186.8	185.9	179.6
375.8	300.2	161.0	160.0	153.8	431.4	344.6	187.3	186.4	180.1
376.9	301.1	161.5	160.5	154.3	432.5	345.5	187.8	187.0	180.6
378.0	302.0	162.0	161.0	154.8	433.6	346.4	188.4	187.5	181.2
379.1	302.9	162.5	161.6	155.4	434.7	347.3	188.9	188.0	181.7
380.2	303.8	163.1	162.1	155.9	435.8	348.2	189.4	188.6	182.3
381.3	304.7	163.6	162.6	156.4	436.9	349.1	190.0	189.1	182.8
382.5	305.6	164.1	163.1	156.9	438.0	350.0	190.5	189.7	183.3
383.6	306.5	164.6	163.7	157.5	439.2	350.9	191.0	190.2	183.9
384.7	307.3	165.1	164.2	158.0	440.3	351.8	191.6	190.7	184.4
385.8	308.2	165.7	164.7	158.5	441.4	352.6	192.1	191.3	184.9
386.9	309.1	166.2	165.2	159.0	442.5	353.5	192.7	191.8	185.5
388.0	310.0	166.7	165.7	159.5	443.6	354.4	193.2	192.3	186.0

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TABLE NO. 9—Concluded.

GLUCOSE (INVERT SUGAR CORRESPONDING TO CUPRIC OXID AND TO COPPER.—*Concluded.*

Cupric Oxide	Copper	Glucose			Cupric Oxide	Copper	Glucose		
		1	2	3			1	2	3
444.7	355.3	193.7	192.9	186.5	494.8	395.3	218.3	217.5	211.0
445.8	356.2	194.3	193.4	187.1	495.9	396.2	218.9	218.0	211.5
446.9	357.1	194.8	194.0	187.6	497.0	397.1	219.4	218.6	212.1
448.0	358.0	195.4	194.5	188.1	498.1	397.9	220.0	219.1	212.6
449.2	358.9	195.9	195.0	188.7	499.2	398.8	220.5	219.7	213.2
450.3	359.7	196.4	195.6	189.2	500.3	399.7	221.1	220.2	213.7
451.4	360.6	197.0	196.1	189.8	501.4	400.6	221.6	220.8	214.3
452.5	361.5	197.5	196.7	190.3	502.5	401.5	222.2	221.4	214.8
453.6	362.4	198.1	197.2	190.8	503.6	402.4	222.8	221.9	215.4
454.7	363.3	198.6	197.7	191.4	504.7	403.3	223.3	222.5	215.9
455.8	364.2	199.1	198.3	191.9	505.9	404.2	223.9	223.0	216.5
456.9	365.1	199.7	198.8	192.5	507.0	405.1	224.4	223.6	217.0
458.1	366.0	200.2	199.4	193.0	508.1	405.9	225.0	224.1	217.6
459.2	366.9	200.8	199.9	193.5	509.2	406.8	225.5	224.7	218.1
460.3	367.7	201.3	200.5	194.1	510.3	407.7	226.1	225.3	218.7
461.4	368.6	201.8	201.0	194.6	511.4	408.6	226.7	225.8	219.2
462.5	369.5	202.4	201.6	195.2	512.5	409.5	227.2	226.4	219.8
463.6	370.4	202.9	202.1	195.7	513.6	410.4	227.8	226.9	220.3
464.7	371.3	203.5	202.6	196.2	514.8	411.3	228.3	227.5	220.9
465.8	372.2	204.0	203.2	196.8	515.9	412.2	228.9	228.1	221.4
466.9	373.1	204.6	203.7	197.3	517.0	413.0	229.5	228.6	222.0
468.1	374.0	205.1	204.3	197.9	518.1	413.9	230.0	229.2	222.5
469.2	374.8	205.7	204.8	198.4	519.2	414.8	230.6	229.7	223.1
470.3	375.7	206.2	205.4	198.9	520.3	415.7	231.2	230.3	223.7
471.4	376.6	206.7	205.9	199.5	521.4	416.6	231.7	230.9	224.2
472.5	377.5	207.3	206.5	200.0	522.5	417.5	232.3	231.4	224.8
473.6	378.4	207.8	207.0	200.6	523.6	418.4	232.8	232.0	225.3
474.7	379.3	208.4	207.6	201.1	524.8	419.3	233.4	232.5	225.9
475.8	380.2	208.9	208.1	201.7	525.9	420.2	234.0	233.1	226.4
477.0	381.1	209.5	208.7	202.2	527.0	421.0	234.5	233.7	227.0
478.1	382.0	210.0	209.2	202.7	528.1	421.9	235.1	234.2	227.6
479.2	382.8	210.6	209.8	203.3	529.2	422.8	235.7	234.8	228.1
480.3	383.7	211.1	210.3	203.8	530.3	423.7	236.2	235.4	228.7
481.4	384.6	211.7	210.9	204.4	531.4	424.6	236.8	235.9	229.2
482.5	385.5	212.2	211.4	204.9	532.5	425.5	237.4	236.5	229.8
483.6	386.4	212.8	212.0	205.5	533.7	426.4	237.9	237.1	230.3
484.7	387.3	213.3	212.5	206.0	534.8	427.3	238.5	237.6	230.9
485.8	388.2	213.9	213.1	206.6	535.9	428.1	239.1	238.2	231.5
487.0	389.1	214.4	213.6	207.1	537.0	429.0	239.6	238.8	232.0
488.1	390.0	215.0	214.2	207.7	538.1	429.9	240.2	239.3	232.6
489.2	390.8	215.5	214.7	208.2	539.2	430.8	240.8	239.9	233.2
490.3	391.7	216.1	215.3	208.8	540.3	431.7	241.4	240.5	233.7
491.4	392.6	216.6	215.8	209.3	541.4	432.6	241.9	241.0	234.3
492.5	393.5	217.2	216.4	209.9	542.5	433.5	242.5	241.6	234.8
492.6	394.4	217.8	216.9	210.4	543.7	434.4	243.1	242.2	235.4

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TABLE NO. 10.

Density of Pure Water Free from Air.

Degrees Centigrade	Tenths of Degrees										Mean Difference
	0	1	2	3	4	5	6	7	8	9	
15	0.999 1266	1114	0962	0809	0655	0499	0343	0185	0026	*9865	—156
16	0.998 9705	9541	9378	9214	9048	8881	8713	8544	8373	8202	—168
17	8029	7856	7681	7505	7328	7150	6971	6791	6610	6427	—178
18	6244	6058	5873	5686	5498	5309	5119	4927	4735	4541	—190
19	4347	4152	3955	3757	3558	3358	3158	2955	2752	2549	—200
20	2343	2137	1930	1722	1511	1301	1090	0878	0663	0449	—211
21	0233	0016	*9799	*9580	*9359	*9139	*8917	*8694	*8470	*8245	—221
22	0.97 8019	7792	7564	7335	7104	6873	6641	6408	6173	5938	—232
23	5702	5466	5227	4988	4747	4506	4264	4021	3777	3531	—242
24	3286	3039	2790	2541	2291	2040	1788	1535	1280	1026	—252
25	0770	0513	0255	*9997	*9736	*9476	*9214	*8951	*8688	*8423	—261
26	0.996 8158	7892	7624	7356	7087	6817	6545	6273	6000	5726	—271
27	5451	5176	4898	4620	4342	4062	3782	3500	3218	2935	—280
28	2652	2366	2080	1793	1505	1217	0928	0637	0346	0053	—289
29	0.995 9761	9466	9171	8876	8579	8282	7983	7684	7383	7083	—298
30	6780	6478	6174	5869	5564	5258	4950	4642	4334	4024	—307
31	3714	3401	3089	2776	2462	2147	1832	1515	1198	0880	—315
32	0561	0241	*9920	*9599	*9276	*8954	*8630	*8304	*7979	*7653	—324
33	0.994 7325	6997	6668	6338	6007	5676	5345	5011	4678	4343	—332
34	4007	3671	3335	2997	2659	2318	1978	1638	1296	0953	—340
35	0610	0267	*9922	*9576	*9230	*8883	*8534	*8186	*7837	*7486	—347
36	0.993 7136	6784	6432	6078	5725	5369	5014	4658	4301	3943	—355

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TABLE NO. 11.

APPARENT WEIGHT (IN AIR WITH BRASS WEIGHTS) OF 100 CUBIC CENTIMETERS OF PURE WATER.

Degrees Centigrade	Weight in Grams	Degrees Centigrade	Weight in Grams	Degrees Centigrade	Weight in Grams
15	99.805	20	99.718	25	99.604
16	99.790	21	99.697	26	99.579
17	99.774	22	99.676	27	99.552
18	99.756	23	99.653	28	99.524
19	99.738	24	99.629	29	99.496
				30	99.466

TABLE NO. 12.

COMPARISON OF METRIC AND U. S. WEIGHTS AND MEASURES.

U. S. and Metric.

1 Inch=25.40005 Millimeters
1 Foot=0.304801 Meter.
1 Square Inch=6.4516 Square Centimeters.
1 Square Foot=0.09290 Square Meter.
1 Cubic Inch=16.38716 Cubic Centimeters.
=16.3867 Cubic Milliliters.
1 Cubic Foot=0.028317 Cubic Meter.
=28.316 Liters.
=0.28316 Hectoliter.
1 U. S. Gallon=3.78533 Liters.
(231 Cubic Inches.)
1 Avoirdupois Ounce= 28.3495 Grams.
1 Avoirdupois Pound=453.592477 Grams.
= 0.45359 Kilogram.
1 Short Ton=907.18486 Kilograms.
(2000 Pounds.)

Metric and U. S.

1 Millimeter=0.03937 Inch.
1 Meter=39.37 Inches.
=3.28083 Feet.
1 Square Centimeter=0.15500 Square Inch.
1 Square Meter=10.764 Square Feet.
1 Cubic Centimeter=0.061023 Cubic Inches.
1 Liter=61.0250 Cubic Inches.
(1000.027 Cubic Centimeters) = 0.264178 U. S. Gallon.
1 Hectoliter=6102.50 Cubic Inches.
=26.4178 U. S. Gallons.
1 Gram=15.432356 Grains.
1 Kilogram=2.20462234 Avoirdupois Pounds.
1 Metric Ton=2204.62234 Avoirdupois Pounds.
= 1.1023 Short Tons.

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TABLE NO. 13.

COMPARISON OF THERMOMETRIC SCALES.

Fahrenheit and Centigrade.

Fahrenheit	Centigrade	Fahrenheit	Centigrade	Fahrenheit	Centigrade	Fahrenheit	Centigrade
°	°	°	°	°	°	°	°
212	100.00						
211	99.44						
210	98.89	165	73.89	120	48.89	75	23.89
209	98.33	164	73.33	119	48.33	74	23.33
208	97.78	163	72.78	118	47.78	73	22.78
207	97.22	162	72.22	117	47.22	72	22.22
206	96.67	161	71.67	116	46.67	71	21.67
205	96.11	160	71.11	115	46.11	70	21.11
204	95.55	159	70.55	114	45.55	69	20.55
203	95.00	158	70.00	113	45.00	68	20.00
202	94.44	157	69.44	112	44.44	67	19.44
201	93.89	156	68.89	111	43.89	66	18.89
200	93.33	155	68.33	110	43.33	65	18.33
199	92.78	154	67.78	109	42.78	64	17.78
198	92.22	153	67.22	108	42.22	63	17.22
197	91.67	152	66.66	107	41.67	62	16.67
196	91.11	151	66.11	106	41.11	61	16.11
195	90.55	150	65.55	105	40.55	60	15.55
194	90.00	149	65.00	104	40.00	59	15.00
193	89.44	148	64.44	103	39.44	58	14.44
192	88.89	147	63.89	102	38.89	57	13.89
191	88.33	146	63.33	101	38.33	56	13.33
190	87.78	145	62.78	100	37.78	55	12.78
189	87.22	144	62.22	99	37.22	54	12.22
188	86.67	143	61.67	98	36.67	53	11.67
137	66.11	142	61.11	97	36.11	52	11.11
186	85.55	141	60.55	96	35.55	51	10.55
185	85.00	140	60.00	95	35.00	50	10.00
184	84.44	139	59.44	94	34.44	49	9.44
183	83.89	138	58.89	93	33.89	48	8.89
182	83.33	137	58.33	92	33.33	47	8.33
181	82.78	136	57.78	91	32.78	46	7.78
180	82.22	135	57.22	90	32.22	45	7.22
179	81.67	134	56.67	89	31.67	44	6.67
178	81.11	133	56.11	88	31.11	43	6.11
177	80.55	132	55.55	87	30.55	42	5.55
176	80.00	131	55.00	86	30.00	41	5.00
175	79.44	130	54.44	85	29.44	40	4.44
174	78.89	129	53.89	84	28.89	39	3.89
173	78.33	128	53.33	83	28.33	38	3.33
172	77.78	127	52.78	82	27.78	37	2.78
171	77.22	126	62.22	81	27.22	36	2.22
170	76.67	125	51.67	80	26.67	35	1.67
169	76.11	124	51.11	79	26.11	34	1.11
168	75.55	123	50.55	78	25.55	33	0.44
167	75.00	122	50.00	77	25.00	32	0.00
166	74.44	121	49.44	76	24.44		

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TABLE. NO. 13—Concluded.

Centigrade and Fahrenheit.

Centigrade	Fahrenheit	Centigrade	Fahrenheit	Centigrade	Fahrenheit	Centigrade	Fahrenheit
°	°	°	°	°	°	°	°
100	212.	75	167.	50	122.	25	77.
99	210.2	74	165.2	49	120.2	24	75.2
98	208.4	73	163.4	48	118.4	23	73.4
97	206.6	72	161.6	47	116.6	22	71.6
96	204.8	71	159.8	46	114.8	21	69.8
95	203.	70	158.	45	113.	20	68.
94	201.2	69	156.2	44	111.2	19	66.2
93	199.4	68	154.4	43	109.4	18	64.4
92	197.6	67	152.6	42	107.6	17	62.6
91	195.8	66	150.8	41	105.8	16	60.8
90	194.	65	149.	40	104.	15	59.
89	192.2	64	147.2	39	102.2	14	57.2
88	190.4	63	145.4	38	100.4	13	55.4
87	188.6	62	143.6	37	98.6	12	53.6
86	186.8	61	141.8	36	96.8	11	51.8
85	185.	60	140.	35	95.	10	50.
84	183.2	59	138.2	34	93.2	9	48.2
83	181.4	58	136.4	33	91.4	8	46.4
82	179.6	57	134.6	32	89.6	7	44.6
81	177.8	56	132.8	31	87.8	6	42.8
80	176.	55	131.	30	86.	5	41.
79	174.2	54	129.2	29	84.2	4	39.2
78	172.4	53	127.4	28	82.4	3	37.4
77	170.6	52	125.6	27	80.6	2	35.6
76	168.8	51	123.8	26	78.8	1	33.8
						0	32.

Centigrade	Fahrenheit
°	°
0.9	1.62
.8	1.44
.7	1.26
.6	1.08
.5	0.90
.4	0.72
.3	0.54
.2	0.36
.1	0.18
Fahrenheit	**Centigrade**
°	°
0.9	0.50
.8	.44
.7	.39
.6	.33
.5	.28
.4	.22
.3	.17
.2	.11
.1	.06

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TABLE NO. 14.

POLARIZATION FROM DEGREE BRIX AND POLARISCOPE READING AFTER DILUTING 110 TO 100 (SCHMITZ' METHOD).

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.														Polariscope Reading
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	
1	0.29	0.29	0.29	0.29	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	1
2		0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.56	0.56	0.56	0.56	0.56	0.56	2
3		0.86	0.86	0.86	0.85	0.85	0.85	0.85	0.85	0.85	0.84	0.84	0.84	0.84	3
4			1.14	1.14	1.14	1.14	1.13	1.13	1.13	1.13	1.13	1.12	1.12	1.12	4
5			1.43	1.43	1.42	1.42	1.42	1.41	1.41	1.41	1.41	1.40	1.40	1.40	5
6				1.71	1.71	1.70	1.70	1.70	1.69	1.69	1.69	1.68	1.68	1.68	6
7				2.00	1.99	1.99	1.98	1.98	1.98	1.97	1.97	1.96	1.96	1.96	7
8					2.28	2.27	2.27	2.26	2.26	2.25	2.25	2.25	2.24	2.24	8
9						2.56	2.55	2.55	2.54	2.54	2.53	2.53	2.52	2.52	9
10						2.84	2.83	2.83	2.82	2.82	2.81	2.81	2.80	2.80	10
11							3.12	3.11	3.11	3.10	3.09	3.09	3.08	3.08	11
12							3.40	3.39	3.39	3.38	3.38	3.37	3.36	3.36	12
13								3.68	3.67	3.66	3.66	3.65	3.64	3.63	13
14								3.96	3.95	3.95	3.94	3.93	3.92	3.91	14
15									4.24	4.23	4.22	4.21	4.20	4.19	15
16										4.51	4.50	4.49	4.48	4.47	16
17										4.79	4.78	4.77	4.76	4.75	17
18											5.06	5.05	5.04	5.03	18
19											5.34	5.33	5.32	5.31	19
20												5.61	5.60	5.59	20
21												5.89	5.88	5.87	21
22													6.16	6.15	22
23													6.44	6.43	23
24														6.71	24
25														6.99	25

Degree Brix from 0.5 to 4	
Tenths of Polariscope Reading.	Percent Sucrose.
0.1	0.03
0.2	0.06
0.3	0.09
0.4	0.11
0.5	0.14
0.6	0.17
0.7	0.20
0.8	0.23
0.9	0.26

Degree Brix from 4.5 to 14	
Tenths of Polariscope Reading.	Percent Sucrose.
0.1	0.03
0.2	0.06
0.3	0.08
0.4	0.11
0.5	0.14
0.6	0.17
0.7	0.19
0.8	0.22
0.9	0.25

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TABLE NO. 14—Continued.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.												Polariscope Reading
	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	
1	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.27	0.27	0.27	0.27	1
2	0.56	0.56	0.56	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	2
3	0.84	0.84	0.83	0.83	0.83	0.83	0.83	0.83	0.82	0.82	0.82	0.82	3
4	1.12	1.11	1.11	1.11	1.11	1.11	1.10	1.10	1.10	1.10	1.09	1.09	4
5	1.40	1.39	1.39	1.39	1.38	1.38	1.38	1.38	1.37	1.37	1.37	1.37	5
6	1.67	1.67	1.67	1.66	1.66	1.66	1.65	1.65	1.65	1.64	1.64	1.64	6
7	1.95	1.95	1.95	1.94	1.94	1.93	1.93	1.93	1.92	1.92	1.92	1.91	7
8	2.23	2.23	2.22	2.22	2.21	2.21	2.20	2.20	2.20	2.19	2.19	2.18	8
9	2.51	2.51	2.50	2.50	2.49	2.49	2.48	2.48	2.47	2.47	2.46	2.46	9
10	2.79	2.79	2.78	2.77	2.77	2.76	2.76	2.75	2.75	2.74	2.74	2.73	10
11	3.07	3.06	3.06	3.05	3.05	3.04	3.03	3.03	3.02	3.02	3.01	3.00	11
12	3.35	3.34	3.34	3.33	3.32	3.32	3.31	3.30	3.30	3.29	3.28	3.28	12
13	3.63	3.62	3.61	3.61	3.60	3.59	3.58	3.58	3.57	3.56	3.56	3.55	13
14	3.91	3.90	3.89	3.88	3.88	3.87	3.86	3.85	3.85	3.84	3.83	3.82	14
15	4.19	4.18	4.17	4.16	4.15	4.14	4.13	4.13	4.12	4.11	4.10	4.10	15
16	4.46	4.46	4.45	4.44	4.43	4.42	4.41	4.40	4.39	4.39	4.38	4.37	16
17	4.74	4.73	4.73	4.72	4.71	4.70	4.68	4.68	4.67	4.66	4.65	4.64	17
18	5.02	5.01	5.00	4.99	4.98	4.97	4.96	4.95	4.94	4.93	4.92	4.91	18
19	5.30	5.29	5.28	5.27	5.26	5.25	5.24	5.23	5.22	5.21	5.20	5.19	19
20	5.58	5.57	5.56	5.55	5.54	5.53	5.51	5.50	5.49	5.48	5.47	5.46	20
21	5.86	5.85	5.84	5.83	5.81	5.80	5.79	5.78	5.77	5.76	5.75	5.73	21
22	6.14	6.13	6.12	6.10	6.09	6.08	6.05	6.05	6.04	6.03	6.02	6.01	22
23	6.42	6.41	6.39	6.38	6.37	6.36	6.34	6.33	6.32	6.31	6.29	6.28	23
24	6.70	6.68	6.67	6.66	6.64	6.63	6.61	6.61	6.59	6.58	6.57	6.55	24
25	6.98	6.96	6.95	6.94	6.92	6.91	6.89	6.88	6.87	6.85	6.84	6.83	25
26	7.26	7.24	7.23	7.21	7.20	7.18	7.16	7.16	7.14	7.13	7.11	7.11	26
27		7.52	7.50	7.49	7.48	7.46	7.44	7.43	7.42	7.40	7.39	7.37	27
28		7.80	7.78	7.77	7.75	7.74	7.72	7.71	7.69	7.68	7.66	7.65	28
29			8.06	8.04	8.03	8.01	7.99	7.98	7.97	7.95	7.93	7.92	29
30			8.34	8.32	8.31	8.29	8.27	8.26	8.24	8.22	8.21	8.19	30
31				8.60	8.58	8.57	8.54	8.53	8.52	8.50	8.48	8.46	31
32				8.88	8.86	8.84	8.82	8.81	8.79	8.77	8.75	8.74	32
33					9.14	9.12	9.09	9.08	9.06	9.05	9.03	9.01	33
34					9.41	9.39	9.37	9.36	9.34	9.32	9.30	9.28	34
35						9.67	9.64	9.63	9.61	9.59	9.58	9.56	35
36						9.95	9.92	9.91	9.89	9.87	9.85	9.83	36
37							10.20	10.18	10.16	10.14	10.12	10.10	37
38							10.47	10.46	10.44	10.42	10.40	10.38	38
39								10.73	10.71	10.69	10.67	10.65	39
40									10.99	10.97	10.94	10.92	40
41									11.26	11.24	11.22	11.19	41
42										11.51	11.49	11.47	42
43										11.79	11.76	11.74	43
44											12.04	12.01	44
45											12.31	12.29	45
46												12.56	46
37												12.83	47

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TABLE NO. 14—Continued.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.												Polariscope Reading
	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	
10	2.72	2.72	2.71	2.71	2.70	2.70	2.69	2.69	2.68	2.68	2.67	2.67	10
11	3.00	2.99	2.99	2.98	2.97	2.97	2.96	2.96	2.95	2.94	2.94	2.93	11
12	3.27	3.26	3.26	3.25	3.24	3.24	3.23	3.23	3.22	3.22	3.21	3.20	12
13	3.54	3.54	3.53	3.52	3.51	3.51	3.50	3.49	3.49	3.48	3.47	3.46	13
14	3.81	3.81	3.80	3.79	3.78	3.78	3.77	3.76	3.75	3.75	3.74	3.73	14
15	4.09	4.08	4.07	4.06	4.05	4.05	4.04	4.03	4.02	4.01	4.01	4.00	15
16	4.36	4.35	4.34	4.33	4.33	4.32	4.31	4.30	4.29	4.28	4.27	4.26	16
17	4.63	4.62	4.61	4.60	4.60	4.59	4.58	4.57	4.56	4.55	4.54	4.53	17
18	4.90	4.90	4.89	4.88	4.87	4.86	4.85	4.84	4.83	4.82	4.81	4.80	18
19	5.18	5.17	5.16	5.15	5.14	5.13	5.12	5.10	5.09	5.08	5.07	5.06	19
20	5.45	5.44	5.43	5.42	5.41	5.40	5.38	5.37	5.36	5.35	5.34	5.33	20
21	5.72	5.71	5.70	5.69	5.68	5.67	5.65	5.64	5.63	5.62	5.61	5.60	21
22	5.99	5.98	5.97	5.96	5.95	5.93	5.92	5.91	5.90	5.89	5.88	5.86	22
23	6.27	6.25	6.24	6.23	6.22	6.20	6.19	6.18	6.17	6.15	6.14	6.13	23
24	6.54	6.53	6.51	6.50	6.49	6.47	6.46	6.45	6.44	6.42	6.41	6.40	24
25	6.81	6.80	6.79	6.77	6.76	6.74	6.73	6.72	6.70	6.69	6.68	6.66	25
26	7.08	7.07	7.06	7.04	7.03	7.01	7.00	6.99	6.97	6.96	6.94	6.93	26
27	7.36	7.34	7.33	7.31	7.30	7.28	7.27	7.25	7.24	7.23	7.21	7.20	27
28	7.63	7.61	7.60	7.58	7.57	7.55	7.54	7.52	7.51	7.49	7.48	7.46	28
29	7.90	7.89	7.87	7.85	7.84	7.82	7.81	7.79	7.78	7.76	7.74	7.73	29
30	8.17	8.16	8.14	8.13	8.11	8.09	8.08	8.06	8.04	8.03	8.01	8.00	30
31	8.45	8.43	8.41	8.40	8.38	8.36	8.35	8.33	8.31	8.30	8.28	8.26	31
32	8.72	8.70	8.68	8.67	8.65	8.63	8.62	8.60	8.58	8.56	8.55	8.53	32
33	8.99	8.97	8.96	8.94	8.92	8.90	8.88	8.87	8.85	8.83	8.81	8.79	33
34	9.26	9.25	9.23	9.21	9.19	9.17	9.15	9.14	9.12	9.10	9.08	9.06	34
35	9.54	9.52	9.50	9.48	9.46	9.44	9.42	9.40	9.38	9.37	9.35	9.33	35
36	9.81	9.79	9.77	9.75	9.73	9.71	9.69	9.67	9.65	9.63	9.61	9.59	36
37	10.08	10.06	10.04	10.02	10.00	9.98	9.96	9.94	9.92	9.90	9.88	9.86	37
38	10.35	10.33	10.31	10.29	10.27	10.25	10.23	10.21	10.19	10.16	10.15	10.13	38
39	10.63	10.61	10.58	10.56	10.54	10.52	10.50	10.48	10.46	10.44	10.41	10.39	39
40	10.90	10.88	10.86	10.83	10.81	10.79	10.77	10.75	10.73	10.70	10.68	10.66	40
41	11.17	11.15	11.13	11.11	11.08	11.06	11.04	11.02	10.99	10.97	10.95	10.93	41
42	11.44	11.42	11.40	11.38	11.35	11.33	11.31	11.28	11.26	11.24	11.22	11.19	42
43	11.72	11.69	11.67	11.65	11.62	11.60	11.58	11.55	11.53	11.51	11.48	11.46	43
44	11.99	11.97	11.94	11.92	11.89	11.87	11.85	11.82	11.80	11.77	11.75	11.73	44
45	12.26	12.24	12.21	12.19	12.16	12.14	12.12	12.09	12.07	12.04	12.02	11.99	45
46	12.53	12.51	12.48	12.46	12.43	12.41	12.38	12.36	12.33	12.31	12.28	12.26	46
47	12.81	12.78	12.76	12.73	12.70	12.68	12.65	12.63	12.60	12.58	12.55	12.53	47
48	13.08	13.05	13.03	13.00	12.98	12.95	12.92	12.90	12.87	12.84	12.82	12.79	48
49	13.35	13.33	13.30	13.27	13.25	13.22	13.19	13.17	13.14	13.11	13.09	13.06	49
50	13.62	13.60	13.57	13.54	13.52	13.49	13.46	13.43	13.41	13.38	13.35	13.33	50
51	13.90	13.87	13.84	13.81	13.79	13.76	13.73	13.70	13.67	13.65	13.62	13.59	51
52			14.11	14.08	14.06	14.03	14.00	13.97	13.94	13.91	13.89	13.86	52
53			14.38	14.36	14.33	14.30	14.27	14.24	14.21	14.18	14.15	14.12	53
54				14.63	14.60	14.57	14.54	14.51	14.48	14.45	14.42	14.39	54
55				14.90	14.87	14.84	14.81	14.78	14.75	14.72	14.69	14.66	55
56					15.14	15.11	15.08	15.05	15.02	14.99	14.95	14.92	56
57					15.41	15.38	15.35	15.31	15.28	15.25	15.22	15.19	57
58						15.65	15.62	15.58	15.55	15.52	15.49	15.46	58
59						15.92	15.88	15.85	15.82	15.79	15.76	15.72	59

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TABLE NO. 14—Continued.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.												Polariscope Reading
							16.5	17.0	17.5	18.0	18.5	19.0	
60							16.15	16.12	16.09	16.06	16.02	15.99	60
61							16.42	16.39	16.36	16.32	16.29	16.26	61
62								16.66	16.62	16.59	16.56	16.52	62
63								16.93	16.89	16.86	16.82	16.79	63
64									17.16	17.13	17.09	17.06	64
65									17.43	17.39	17.36	17.32	65
66										17.66	17.63	17.59	66
67										17.93	17.89	17.86	67
68											18.16	18.12	68
69											18.43	18.39	69
70												18.66	70
71												18.92	71

Degree Brix from 14.5 to 20.	
Tenths of Polariscope Reading.	Percent Sucrose.
0.1	0.03
0.2	0.05
0.3	0.08
0.4	0.11
0.5	0.13
0.6	0.16
0.7	0.19
0.8	0.21
0.9	0.24

Degree Brix from 2.05 to 24.	
Tenths of Polariscope Reading.	Percent Sucrose.
0.1	0.03
0.2	0.05
0.3	0.08
0.4	0.11
0.5	0.13
0.6	0.16
0.7	0.18
0.8	0.21
0.9	0.24

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TABLE NO. 14—Continued.

Polariscope Reading	DEGREE BRIX, 27½° C. HYDROMETER.										Polariscope Reading
	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	
25	6.65	6.64	6.62	6.61	6.59	6.58	6.57	6.55	6.54	6.53	25
26	6.92	6.90	6.89	6.87	6.86	6.84	6.83	6.82	6.80	6.79	26
27	7.18	7.17	7.15	7.14	7.12	7.11	7.09	7.08	7.06	7.05	27
28	7.45	7.43	7.42	7.40	7.39	7.37	7.36	7.34	7.33	7.31	28
29	7.71	7.70	7.68	7.67	7.65	7.63	7.62	7.60	7.59	7.57	29
30	7.98	7.96	7.95	7.93	7.91	7.90	7.88	7.87	7.85	7.83	30
31	8.24	8.23	8.21	8.19	8.18	8.16	8.14	8.13	8.11	8.09	31
32	8.51	8.49	8.48	8.46	8.44	8.42	8.41	8.39	8.37	8.35	32
33	8.78	8.76	8.74	8.72	8.71	8.69	8.67	8.65	8.63	8.62	33
34	9.04	9.02	9.01	8.99	8.97	8.95	8.93	8.91	8.90	8.88	34
35	9.31	9.29	9.27	9.25	9.23	9.21	9.19	9.18	9.16	9.14	35
36	9.57	9.56	9.54	9.52	9.50	9.48	9.46	9.44	9.42	9.40	36
37	9.84	9.82	9.80	9.78	9.76	9.74	9.72	9.70	9.68	9.66	37
38	10.11	10.09	10.07	10.04	10.02	10.00	9.98	9.96	9.94	9.92	38
39	10.37	10.35	10.33	10.31	10.29	10.27	10.25	10.22	10.20	10.18	39
40	10.64	10.62	10.60	10.57	10.55	10.53	10.51	10.49	10.47	10.44	40
41	10.90	10.88	10.86	10.84	10.82	10.79	10.77	10.75	10.73	10.70	41
42	11.17	11.15	11.12	11.10	11.08	11.06	11.03	11.01	10.99	10.97	42
43	11.44	11.41	11.39	11.37	11.34	11.32	11.30	11.27	11.25	11.23	43
44	11.70	11.68	11.65	11.63	11.61	11.58	11.56	11.54	11.51	11.49	44
45	11.97	11.94	11.92	11.90	11.87	11.85	11.82	11.80	11.77	11.75	45
46	12.23	12.21	12.18	12.16	12.13	12.11	12.08	12.06	12.04	12.01	46
47	12.50	12.47	12.45	12.42	12.40	12.37	12.35	12.32	12.30	12.27	47
48	12.77	12.74	12.71	12.69	12.66	12.64	12.61	12.58	12.56	12.53	48
49	13.03	13.01	12.98	12.95	12.93	12.90	12.87	12.85	12.82	12.79	49
50	13.30	13.27	13.24	13.22	13.19	13.16	13.14	13.11	13.08	13.05	50
51	13.56	13.54	13.51	13.48	13.45	13.43	13.40	13.37	13.34	13.32	51
52	13.83	13.80	13.77	13.75	13.72	13.69	13.66	13.63	13.60	13.58	52
53	14.10	14.07	14.04	14.01	13.98	13.95	13.92	13.90	13.87	13.84	53
54	14.36	14.33	14.30	14.27	14.25	14.22	14.19	14.16	14.13	14.10	54
55	14.63	14.60	14.57	14.54	14.51	14.48	14.45	14.42	14.39	14.36	55
56	14.89	14.86	14.83	14.80	14.77	14.74	14.71	14.68	14.65	14.62	56
57	15.16	15.13	15.10	15.07	15.04	15.01	14.97	14.94	14.91	14.88	57
58	15.43	15.39	15.36	15.33	15.30	15.27	15.24	15.21	15.17	15.14	58
59	15.69	15.66	15.63	15.60	15.56	15.53	15.50	15.47	15.44	15.40	59
60	15.96	15.93	15.89	15.86	15.83	15.80	15.76	15.73	15.70	15.67	60
61	16.22	16.19	16.16	16.12	16.09	16.06	16.03	15.99	15.96	15.93	61
62	16.49	16.46	16.42	16.39	16.36	16.32	16.29	16.25	16.22	16.19	62
63	16.76	16.72	16.69	16.65	16.62	16.59	16.55	16.52	16.48	16.45	63
64	17.02	16.99	16.95	16.92	16.88	16.85	16.81	16.78	16.74	16.71	64
65	17.29	17.25	17.22	17.17	17.15	17.11	17.08	17.04	17.01	16.97	65
66	17.55	17.52	17.48	17.45	17.41	17.37	17.34	17.30	17.27	17.23	66
67	17.82	17.78	17.75	17.71	17.67	17.64	17.60	17.57	17.53	17.49	67
68	18.09	18.05	18.01	17.97	17.94	17.90	17.86	17.83	17.79	17.75	68
69	18.35	18.31	18.28	18.24	18.20	18.16	18.13	18.09	18.05	18.02	69

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TABLE NO. 14—Concluded.

DEGREE BRIX, 27½° C. HYDROMETER.

Polariscope Reading	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	Polariscope Reading
70	18.62	18.58	18.54	18.50	18.47	18.43	18.39	18.35	18.31	18.28	70
71	18.88	18.84	18.81	18.77	18.73	18.69	18.65	18.61	18.58	18.54	71
72	19.15	19.11	19.07	19.03	18.99	18.95	18.92	18.88	18.84	18.80	72
73	19.42	19.38	19.34	19.30	19.26	19.22	19.18	19.14	19.10	19.06	73
74		19.64	19.60	19.56	19.52	19.48	19.44	19.40	19.36	19.32	74
75		19.91	19.87	19.83	19.78	19.74	19.70	19.66	19.62	19.58	75
76			20.13	20.09	20.05	20.01	19.97	19.93	19.88	19.84	76
77			20.40	20.35	20.31	20.27	20.23	20.19	20.15	20.10	77
78				20.62	20.58	20.53	20.49	20.45	20.41	20.37	78
79				20.88	20.84	20.80	20.75	20.71	20.67	20.63	79
80					21.10	21.06	21.02	20.97	20.93	20.89	80
81					21.37	21.32	21.28	21.24	21.19	21.15	81
82						21.59	21.54	21.50	21.45	21.41	82
83						21.85	81.81	21.76	21.72	21.67	83
84							22.07	22.02	21.98	21.93	84
85							22.33	22.28	22.24	22.19	85
86								22.55	22.50	22.45	86
87								22.81	22.76	22.72	87
88									23.02	22.98	88
89									23.29	23.24	89
90										23.50	90
91										23.76	91

Comparison of Brix at 27°½ with Sp. Gr. $\frac{27.5°}{27.5°}$

Brix.	Sp. Gr. $\frac{27.5°}{27.5°}$	Brix.	Sp. Gr. $\frac{27.5°}{27.5°}$	Brix.	Sp. Gr. $\frac{27.5°}{27.5°}$
0.5	1.00194	8.5	1.03370	16.5	1.06723
1.0	1.00389	9.0	1.03574	17.0	1.06940
1.5	1.00583	9.5	1.03779	17.5	1.07157
2.0	1.00778	10.0	1.03984	18.0	1.07374
2.5	1.00974	10.5	1.04191	18.5	1.07593
3.0	1.01169	11.0	1.04397	19.0	1.07812
3.5	1.01366	11.5	1.04605	19.5	1.08032
4.0	1.01564	12.0	1.04813	20.0	1.08253
4.5	1.01762	12.5	1.05023	20.5	1.08475
5.0	1.01960	13.0	1.05232	21.0	1.08697
5.5	1.02160	13.5	1.05443	21.5	1.08920
6.0	1.02360	14.0	1.05654	22.0	1.09144
6.5	1.02561	14.5	1.05867	22.5	1.09369
7.0	1.02762	15.0	1.06080	23.0	1.09595
7.5	1.02964	15.5	1.06294	23.5	1.09821
8.0	1.03167	16.0	1.06508	24.0	1.10048

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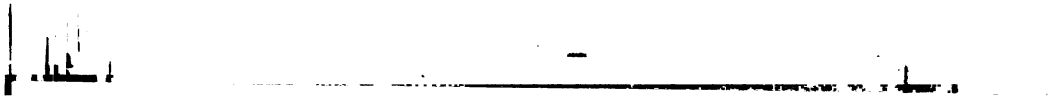

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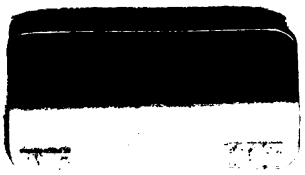

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